

AMERICAN PRINTING HOUSE

FOR THE BLIND

[Annual] report on research and  
development, 1970-~~current~~

1991



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# American Printing House for the Blind

INCORPORATED

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MAR 21 1972

## Educational Research, Development, and Reference Group

### Report on Research and Development

#### Activities - Fiscal 1970

Fiscal year 1970 was one of the most significant in the history of educational research and development at the American Printing House (APH). Research and development activity was increased and broadened, a reorganization incorporating the activities of the Department of Educational Research (DER) and the Instructional Materials Reference Center (IMRC) was accomplished, and the research and development staff brought to full strength.

For some time it had been apparent that there was considerable overlap in function between the research activities of the IMRC and the DER and, from the administrative viewpoint, a number of ambiguities as to roles and responsibilities existed. Consequently, it was decided to combine the activities of both these units into an Educational Research, Development, and Reference Group (ERDARG) coordinated by Dr. Carson Nolan who is directly responsible for all educational research and development. The group is subdivided into a Behavioral Research Section, an Educational Materials Research and Development Section, and an Educational Materials Reference Section. These latter two sections comprise the IMRC. Mr. Carl Lappin remains Director of the IMRC with overall fiscal administrative responsibility and has operational responsibility for the information storage, retrieval, and dissemination functions of the Educational Materials Reference Section. All these activities are now housed on the third floor of the APH administration building in about 6,500 square feet of space. By the end of the year the research and development staff had been expanded to 13 to include four people trained to the doctorate level, two at the educational specialist level, and three at the master's level. A list of personnel and their titles is appended to this report.

The research internship program has been successfully continued. Our three interns during Fiscal 1970 as in the past were from Peabody College. Two of them completed their doctoral dissertations as part of our research program and the remaining individual completed an educational

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specialists thesis. During Fiscal 1971, we will have only one intern from Illinois State University at Normal who, as part of her program, will work on a master's thesis. In addition to our intern, we have two other graduate students, one from the University of Louisville and one from Peabody participating in our research program.

### Progress in Specific Research Activities

#### A. Design of an Aural Study System for the Blind

We are now in the third year of this project which is supported by a grant from the U. S. Office of Education. The purpose of the project is to study the process of learning through listening and to develop a system specifically for this purpose. The system will include especially designed playback equipment, textbook formats, and study techniques. During Fiscal 1970 research on the project took several directions.

##### 1. Textbook Design

Information derived from the earlier consumer surveys and from the task analysis of study through listening was used to design experimental text materials combining the braille and recorded media. An experimental unit of a history book was designed that carried the body of the text recorded on a disc designed to permit near immediate access to any part of the text. Tables of contents, index information, study questions, maps, graphs, and charts were provided in closely correlated braille form. These materials were developed by June Morris.

##### 2. Critique of the Aural Study Materials

During the spring, an expert critique of the experimental text materials as utilized in the prototype player was conducted. Four blind consumers (one psychologist, two special educators, and one rehabilitator) used the text and the player for periods of a few hours up to several days under instructions to comment critically on any or all aspects of the system. These comments were tabulated and categorized and will be used as guides to modification of the study system. June Morris coordinated this effort with Roy Brothers participating.

##### 3. Effect of Message Length and Frame of Reference upon Learning by Listening

Learning theorists have long considered the amount of material attempted and a prior frame of reference about what was to be learned significant factors in learning. To explore the relevance of these factors for listening through learning, 160 blind high school students divided into



higher and lower groups according to mental ability listened to a recording of historical nature. Equal groups of students listened to the 24 minute recording when it was divided into 2, 3, 4, and 6 minute segments. Students took notes during the times between segments for periods designed so that total task time for all groups was equal. Prior to listening to their assigned segment length, one-half of the group heard a one-minute summary of the total message while a control group heard a one-minute message of nonspecific information about the text. Analysis of the results revealed no significant effects due to variation of message length or presence or absence of a prior frame of reference as defined by the study. This research was conducted by Roy Brothers and served as his doctoral dissertation at Peabody College.

#### Research Planned for Fiscal 1971

##### 4. Further Study of the Effects of a Prior Frame of Reference in Learning by Listening

Four studies, two involving social studies and science materials at elementary and high school levels, are planned. Each study will involve 108 students, half braille and half large type readers. Equal groups of students will listen to 13 minute recorded passages with immediate tests of comprehension under three experimental conditions: No frame of reference, a general frame of reference, and a specific frame of reference to be given prior to listening. As contrasted with the earlier research and in keeping with last years experimental textbook design, frames of reference will be written instead of recorded. June Morris will be responsible for this research and will be assisted by Marvin Murr.

##### 5. Further Study of Effects of Message Length on Learning by Listening

This research will use the 24 minute historical recording used previously, however, the message segments studied will be 6, 8, 12, and 24 minutes. Subjects will be legally blind braille and large type readers from grades 9-12. Instead of taking notes in the intervals between segments, students will be tested for comprehension of the preceding segment using a proportionate part of a 60 item comprehension test. Comprehension will be retested after a three day interval. The researcher in this study is Roy Brothers who will be assisted by Marvin Murr.

##### 6. Evaluation of the Aural Study System

Following the critique of the study system, construction of four additional players was initiated. During the coming year these players together with the experimental recorded and brailled text materials will be evaluated during use by students. Evaluation, will occur at two levels of complexity: a. the students success in learning to understand and operate



the materials and b. the students success in attaining the goals of specific learning tasks. Collaborating in this evaluation will be June Morris and Roy Brothers.

## B. Program for Basic Research in Tactual Perception

For decades lack of knowledge of the very basic characteristics of tactual perception has impeded progress in the design of educational materials for the blind. Three years ago, the Board of Trustees of APH set aside an adequate fund to initiate a long term program of research in this area. Starting with Fiscal 1971, Edward Berla', a recent doctoral graduate in experimental psychology from the University of Cincinnati, joined the research staff in order to initiate such a program.

### Research Conducted during Fiscal 1970

#### 1. Relative Legibility of Raised and Incised Tactual Figures

It has long been a practice to symbolically represent some tactual figures by lines cut into the surface of displays. A common example is the representation of rivers on APH maps. Experience in research in map reading has suggested that such incised representations may be far inferior to the same figures when represented as raised lines. In order to explore this, 69 braille readers in grades 4-12 were required to examine 14 tactual form discrimination items when the figures involved were reproduced in both raised and incised line form. Each discrimination item required the student to inspect a stimulus figure located on the left of a card and then pick out an identical figure from among four similar figures located on the right.

Results showed students made 7% more errors on the incised figures. Of much more importance, reading time for incised figures was 38% greater than for raised figures. This research was conducted by Carson Nolan with Ken Coy responsible for the materials.

### Research Planned for Fiscal 1971

#### 2. Review of Literature

A thorough review of the literature on tactual perception will be made. This review will serve to refresh the principal investigator in this area and serve as a definitive background for planning an integrated program of research. The reviewer is to be Edward Berla'.



### 3. The Relationship Between Size and Complexity on Tactual Discrimination of Line Forms

This study was suggested by difficulties encountered in attempting to decide the appropriate size for embossed geometrical figures to be used in a readiness program. Twenty-four primary level braille readers will discriminate histogram-like figures that will vary among three levels of complexity and three size levels. Pair-comparison techniques will be used and each subject will serve as its own control. Edward Berla' will conduct the research with assistance from Marvin Murr.

## C. Educational Materials Research and Development by the IMRC

### 1. Science

#### Research and Development during Fiscal 1970

##### a. Science Institute

During the spring five science teachers from both residential and public school programs for the blind were invited to APH to participate in a three day planning Institute. The purpose of the Science Institute was to examine areas in science where deficits in instructional materials were believed to exist, to identify specific aids necessary for teaching basic concepts in these areas, and to suggest priorities for development of relevant aids and materials. It was felt that the Institute accomplished these purposes. Among priority suggestions for materials were those for three-dimensional models illustrating a broad range of biological forms, materials for earth science (weather kit, water chemistry kit, three dimensional geological models), usable chemistry experiments with appropriate laboratory equipment, atomic models, and a sound kit for physical science. Frank Franks coordinated this Institute.

##### b. Simple Machines

The development of models of aids to demonstrate the concepts of simple machines was reported last year. These included the screw, inclined plane, lever, pulleys, and others. As a consequence of production engineering, changes were made in some of the devices. The instructional program designed to accompany these devices was rewritten during the year to accomodate these changes. Annette Bettinger served as consultant on this project.

#### Research and Development Planned for Fiscal 1971

##### c. Three Dimensional Biological Models (Invertebrates)

The purpose of this project is to select species of animals which are characteristic of the major invertebrate phyla and to develop three dimensional models which depict the morphological feature of each in ways that are legible to the visually handicapped. Once developed the models will be



empirically tested to determine the degree to which visually handicapped children in different grade levels can discriminate the various chromatic and tactual features on each. Frank Franks and Richard Baird are responsible for this research.

#### d. Primary Science Laboratory

This project proposes to select 20 basic science concepts that are presented in the primary grades and to develop a laboratory to facilitate their instruction. The lab will include the instruments, classroom aids, instructional materials, and teachers guides necessary to teach the concepts. The feasibility of this approach will be tested in a pilot project that will develop materials for only three concepts: work, sound and hearing, and temperature. The educational validity of these materials will be tested in actual classroom situations. Positive results should lead to completion of the laboratory in Fiscal 1972. Frank Franks, Richard Baird, and Karen Hart are responsible for this activity.

### 2. Mathematics

#### Research and Development during Fiscal 1970

##### a. Mathematics Institute

Six teachers of the blind from residential and public school programs participated in this three day Institute. The purposes of the Mathematics Institute were similar to those for the Science Institute earlier described. Again much valuable guidance resulted. A large number of needed materials at the elementary and intermediate levels were identified. Among these were a primary mathematics laboratory, a larger abacus, an improved graph board, an improved raised line drawing kit, a pythagorean theorem demonstration kit, and materials for computer math. This Institute was also coordinated by Frank Franks.

#### Research and Development Planned for Fiscal 1971

##### b. Design of a Larger Abacus

One recommendation from the Mathematics Institute called for design of an abacus 33% larger than the currently available Cranmer Abacus. Provision of a large abacus was suggested in order to extend the use of this device to younger blind children and others who lack the manipulative skill required by the smaller device. Models of this device will be developed by Ken Coy and empirically tested under the direction of Frank Franks.

##### c. Current Achievement in Arithmetic Computation by Braille Students

A survey of arithmetic achievement conducted in residential schools 12 years ago revealed many deficiencies in performance. These results stimulated the development of the abacus as a tool for the blind and several curricular research programs. This survey will be replicated in



14 residential schools through testing blind children in grades 3, 4, 6, and 8 with appropriate levels of Form X, Stanford Achievement Test. The results when analysed will be used to identify problem areas where materials development might prove fruitful. This research is being conducted by Roy Brothers.

#### d. Primary Mathematics Laboratory

The purpose of this project is to select basic mathematics concepts that are presented in the primary grades and develop a laboratory that includes materials and techniques necessary to teach these concepts. A pilot study involving such development for these concepts will be carried out to include empirical validation of the materials and techniques for the three concepts in a classroom setting. If results are positive, materials for the remaining concepts will be developed and validated in Fiscal 1972. Frank Franks, Hilda Caton, and Eleanor Pester are responsible for this research.

#### e. Geometric Forms

The intention of this pilot study is to investigate the feasibility of producing a kit of prescriptive materials to facilitate instruction of geometric concepts in the elementary grades. The study will include simple geometric forms of various sizes, hollow geometric forms of equal volume which can be filled with sand, plane figures, and three-dimensional materials in thermoform to compliment all forms. The materials will allow the student to sequentially conceptualize the diagrammatic illustrations found in braille texts by moving from the geometric form (solid) to a plane figure, to a three-dimensional representation. Investigation and development of materials will be guided by contemporary instructional objectives of the elementary mathematics curriculum. This study will be conducted by Frank Franks and Roger Huff.

### 3. Social Studies

#### Research and Development during Fiscal 1970

##### a. Illustrations in Social Studies Textbooks as They Affect the Visually Handicapped

The purpose of the study was to explore the educational problems arising from transcribing ink print social studies texts (grades 1-9) into braille since much information in these texts is presented in the form of maps, graphs, charts, pictures, and tables. In order to do this, the frequency of occurrence of these graphics in several series of textbooks was tabulated and related to their frequency of occurrence in their braille counterparts. Some of the findings were that representation of all illustrations is reduced through braille transcription, that this ranges from almost 100% reduction in grades 1 and 2 down to about 80% in the upper grades, that maps are eliminated least and pictures entirely, and that diagrams are most widely used to introduce new concepts in ink print but for the most part diagrams are omitted in braille. These and other findings will be used in



planning research and development activities in this area. This research was conducted by Dharmasena Arampatta in his capacity of research intern and served as his educational specialist thesis at Peabody College.

## b. Geographical Concepts

### (1) Criteria for Evaluation of Geographical Concepts

The purpose of this project was to develop multiple-choice tests to be used to evaluate the outcome of training designed to improve knowledge of 40 geographical concepts. Using material developed last year, a 40 item multiple-choice test was developed. This test had good face validity and high reliability. In addition, the test was designed to be used in two equivalent forms of 20 items each if desired. These tests can be used to evaluate the outcome of training using the landforms to be described subsequently. Frank Franks and Carson Nolan were responsible for this project.

### (2) Legibility of Landforms Designed to Teach Geographic Concepts

A landform is a small (8 x 8 inch) psuedo-map illustrating a few geographical features of the earth in exaggerated relief form and also in color. A set of seven landforms was developed to illustrate the 40 geographical concepts upon which the test, just described, was based. These seven landforms were evaluated for legibility using a group of 48 visually handicapped students. This group included eight braille and eight large type readers each from grades 6, 8, and 10. In individual testing, students were given a verbal definition of each geographical concept and then were asked to find it on the appropriate landform. Although there were significant grade differences, the mean overall performance of subjects was 84% correct identifications. Consequently, the landforms were judged to have adequate legibility. This research was conducted by Frank Franks with assistance from Ken Coy in development of the experimental materials.

### (3) Teaching Geographical Concepts to Young Children with Landforms

The purpose of this study was to evaluate the landforms in an actual instructional situation with visually handicapped students in grades 3 and 4. This group was pretested for knowledge of 20 basic geographical concepts. All students next were given a one week instructional program consisting of 10 20-30 minute sessions using five small landforms illustrating the 20 basic geographical concepts. As a final test the students were asked to locate these 20 geographical features of the earth. Mean score on the pretest for the group was 52% correct. As a result of instruction, the mean score for the group increased to 97% correct. Consequently, the educational usefulness of the landforms was demonstrated. These materials and their accompanying instructional program will be produced for general distribution. This research was carried out by Frank Franks.



#### 4. Low Vision Training

##### a. Instructional Materials Development

Personnel of the IMRC participated in a nationwide effort to stimulate functional training of low vision. IMRC responsibility was to publish and distribute the necessary materials. Accordingly, copy for the Visual Efficiency Scale was refined to final form and published along with administrative instructions for the scale, record forms, and a teachers guide. These materials are now available. Participating personnel were Amie Dennison and Carson Nolan

##### b. Development and Evaluation of Seated Parquetry

Parquetry materials consist of different colored blocks of triangular, diamond, and rectangular shape that can be used to copy or create intricately shaped and colored designs of varying complexity. Such materials are widely used in programs designed to teach children to compare and discriminate forms and colors. Use of these materials by handicapped children is complicated by the high probability of accidentally disrupting a design before it is completed. To avoid this problem, recessed representations of the patterns to be copied were developed in which the blocks making up a pattern could be seated. The recess is deep enough so that the seating board must be turned almost vertically before the blocks will fall out or become disarranged. Eight parquetry patterns, recessed boards, and necessary blocks to copy the patterns were created for possible use in the low visual function training programs to be carried out in the fall of Fiscal 1971. These materials will be accompanied by a questionnaire which will request teachers to evaluate the materials according to a number of criteria including student interest, ease of use, independence of use, durability, and others. The materials were developed by Amie Dennison and Ken Coy. The evaluation phase of the project is under the direction of Roy Brothers.

#### 5. Educational Materials for Multi-handicapped Visually Impaired

##### Research and Development during Fiscal 1970

##### a. Survey of Materials Needs

The purpose of this study was to survey the needs of the multi-handicapped visually impaired (mhvi) child in order to formulate implications for the development of instructional materials. The mhvi child was defined as a child who has two or more educationally significant handicapping conditions, one of which is visual impairment

Replies to a two-part questionnaire were received from 258 of 293 organizations which had been identified as possibly having educational programs for mhvi children. Ninety-nine of these failed to meet the criteria for the study. Consequently, results were based on data describing 3443 mhvi children from 159 organizations.



There was an average of 3.28 handicaps per child reported. Visual impairment, mental retardation, speech defect, and emotional disturbance were the most frequently occurring handicapping conditions. Non-attending behavior, emotional disturbance, experiential deprivation, language and communication problems, and the inability to process information and stimuli properly were the most frequently mentioned problems. Thirty-seven percent of the children reported were classified as totally blind, while 43% had a visual acuity of 20/200 or less.

Communication skills development was identified as the area of most significant educational concern. Twenty-four percent of the children reported were considered to be non-verbal. Twelve percent were identified as using neither braille, print, nor listening modes. Braille users comprised 28% of the children reported. Twenty-nine percent used large type and 27% used listening materials only.

Most of the mhvi children reported were depicted as having complex needs. Seventy-six percent were classified as requiring individualized instruction most of the time.

The curriculum of these children was characterized as being very elementary and devoted largely to teaching basic skills and concepts. It was suggested that the focus of the curriculum be life and experience centered. The types of instructional materials suggested were very similar to materials which are used by very young children. The survey was conducted by Fay Leach and served as her doctoral dissertation at Southern Baptist Theological Seminary.

#### Research and Development Planned for Fiscal 1971

##### b. Survey of Available Recorded Materials for Development of Language Skills

A survey will be made of all catalogues of commercial distributors of recorded materials for instruction in language skills. Available materials will be listed and classified under one of the following categories: communication programs, listening skills, phonics, speech, language concepts, spelling, and teacher training. Included also will be the source of each material and its price. This list will be made generally available at no cost. Fay Leach will be the researcher.

##### c. Recorded Materials for the Development of Elementary Communications Skills: A Guide

A guide will be developed containing two sections. The first will be a brief summary outlining the sequential development of elementary communications skills. Special problems of visually impaired children will be described. The second section will contain a listing of materials suitable for use over the range of development described. These materials will be identified from among those listed in item (b) above following specific evaluation of their usefulness with blind children. This work will be done by Fay Leach.



## 6. Braille Reading Research Program

### Research Conducted during Fiscal 1970

#### a. Braille Remedial Reading Training Program

Previous research at APH called attention to the importance of character and code recognition skills to reading efficiency. The purpose of this project was to define and validate a remedial training program in character recognition skills. Accordingly, a program providing for individual training in recognition of 176 braille characters, contractions, and short-form words was designed. The program called for training periods of one-half hour duration on 15 consecutive school days. Motivating the student through knowledge of results and self-competition was stressed.

Trial use of the program in several residential schools involved 72 students, half of whom were controls. Comparison of pre- and post-test means revealed that experimental subjects increased accuracy of code recognition by 60% as compared to 11% for controls. Increases in rate of code recognition was three times that of the control group. The experimental group increased its silent reading speed 30% as compared to a 10% increase for controls. Very poor experimental readers increased silent reading speeds by 62%. Consequently, the program was judged successful and will be published and distributed for general use. This research was conducted by Dick Umsted and served as his doctoral dissertation at Peabody College.

#### b. Evaluation of Teacher Prepared Reading Materials

During the past year, encouragement has been offered to several teachers and graduate students to develop braille reading materials. Results have included two braille reading readiness programs, a pre-primer reading program, and a braille writing program. The quality of these materials has been encouraging, yet their lack of coordination with and integration into regular braille reading programs has caused their usefulness to be questioned. Hilda Caton and Carson Nolan have been responsible for work with these materials.

### Research Planned for Fiscal 1971

#### c. Primary Reading Institute

As a consequence of the questions arising from evaluation of the teacher and student developed materials described above, it was decided to seek the advice of a small group of experienced primary reading teachers. A Primary Reading Institute will be held at APH for three days during November 1970. Five teachers from both public and residential schools will participate with APH personnel in further review and evaluation of the teacher prepared materials, analysis of needs for primary braille reading materials, and consideration of the need for development of an integrated readiness and primary reading program. The Institute will be coordinated by Hilda Caton and will be supported by the DeWitt Wallace Research Fund.



## 7. Other IMRC Educational Materials Research and Development

### Research Conducted during Fiscal 1970

#### a. Use of a Dissectable Doll to Teach Body Image Concepts to Young Children

One of the readiness materials suggested earlier by consultants was a dissectable doll to be used to teach the names of body parts and their relations. During the year a training program involving 20 sessions of 15 minutes duration was designed and pretested. Design of the trial dolls was completed and 10 copies produced. These materials will be empirically evaluated during the fall of 1970 at eight residential schools. Approximately 40 kindergarten level blind students will serve as subjects with half receiving training. All subjects will be tested before and after training to determine knowledge of body parts. Don Walker of the University of Virginia is conducting this research under a cooperative arrangement. Ken Coy developed the trial models of the dolls.

#### b. Areal Symbols: Use of Commonly Available Materials as Masters

Many of the models made in our model shop rely on use of textural differences in surfaces for legibility. For model making purposes these surfaces are almost invariably reproduced in vacuum formed plastic. The purpose of this research was to attempt to identify textures from among commercially available materials such as coarse fabrics and wire screens that would be tactually distinct when reproduced through this medium. Twelve such textures were selected and tested using pair-comparison techniques. Subjects were 80 braille readers in grades 4-12. Criterion for acceptable legibility was 10% or fewer errors between any pair. Seven textures meeting this criterion were identified. Joan Bott and Carson Nolan were responsible for this research. Ken Coy prepared the materials.

#### c. Adaptation of the "Listen and Think" Materials

This program is published by Educational Developmental Laboratories (A Division of McGraw-Hill) and is designed to train students over a wide range of grades in listening comprehension skills. The program at each grade level consists of a workbook and 15 tapes designed to give students practice in listening for different purposes. While the materials are directly adaptable to use by large type readers, their use with braille readers presents a problem. Attempts to augment the instructions to teachers to enable braille users to work with materials proved unsuccessful. Consequently, it was decided to incorporate all the workbook material into the tapes. This would provide a format which both large type and braille readers could use. Students will use answer sheets to respond to comprehension questions. Five lessons were adapted in this manner. These will be subjected to trial use in November 1970. Fay Leach is undertaking this work.



#### d. Magazine Paper Evaluation

At the request of the Plant Manager of APH several types of magazine papers were evaluated as to their desirability by blind readers. Two such studies were conducted employing a total of 100 blind high school students and adults as subjects. In each study, selections from Readers Digest printed on different papers were randomly presented to each subject. He was asked to read the selections and then rank the materials according to his paper preference. In each study a clear preference for the same paper was expressed. June Morris and Carson Nolan made this evaluation.

#### Research and Development Planned for Fiscal 1971

##### e. Evaluation of Microfiche Displays for Large Type Use

Microfiche are small cards of clear film upon which it is possible to place the negative images of 60 or more regular book pages. These images are read on a viewer which optically enlarges the images and projects them on the reverse side of the viewing screen. By varying the optics and screen size, large type images can be achieved. This system offers a partial solution to the large type book short run problem since material can be easily and inexpensively prepared in this medium.

Previous work in this area had identified an adequate system of this kind. Plans were just about completed for APH to adopt and distribute this system, when the viewer manufacturer discontinued this activity. Subsequently, contact has been established with the organization taking over manufacture of these viewers. The potential of working with this group will be explored as well as the potential of other systems. Carson Nolan and Amie Dennison will collaborate in this project.

##### f. Evaluation of a Magnifier for Use by Large Type Readers

A large magnifier, the VIP Master Lens, manufactured by the EdnaLite Corporation will be evaluated during Fiscal 1971. Both teacher evaluations and comparative measures of students reading ability will be used as criteria. Studies will involve legally blind large type readers in both public and residential school programs. Carson Nolan and Amie Dennison will be responsible for this activity.

##### g. Primary Curricular Concepts Which Influence Self-Mobilization in the Young Blind Child

An exploratory study will be made to identify concepts from primary grade curricula that have implications for the development of self-mobilization skills in young blind children. The concepts investigated will be drawn from analysis of mathematics, science, and social studies and will include not only body awareness, simple direction, movement in space, but also how to follow directions, the concepts of distance and scale, and psychomotor and manipulative skills as they relate to instructional objectives of the educational curriculum. This study will be conducted by Frank Franks and Roger Huff. Marvin Murr will assist with the analysis used in this study.



#### D. Exploring the Feasibility of a Major Research Attack on Braille Code Problems

This project arose as a consequence of deliberations of the Braille Authority and its Advisory Council which have resulted in the identification of many braille code problems in the areas of textbook formats, charts and diagrams, mathematics and science, music notation, and computer notation. Subsequently, these groups obtained a grant from Social Rehabilitation Services to explore the feasibility of organizing a major research and development program to solve the code problem. APH was requested to undertake the feasibility study. Cleves Kederis and Carson Nolan will conduct this research during Fiscal 1971.

#### E. Other APH Supported Research during Fiscal 1970

##### 1. Relationships Between Visual Acuity and Reading Medium for Blind Children - 1969

This is the fourth of a series of such studies that have been made about every three years since 1959. These studies are based on the data obtained through the annual registration of legally blind children with the APH.

a. The total number of legally blind students registered with the APH in January of 1969 was 20,512. This was an increase of 1,505 over the 1966 quota registration.

b. Of this population, 6,722 students were registered in residential schools for the blind, 12,049 were students in local day school programs, 763 were enrolled in state commission programs, and 345 were enrolled in residential schools for the multiply handicapped.

c. The greatest proportionate change occurred in the multiply handicapped residential programs where enrollment increased by 29%. Commission programs witnessed an increase of 15% while local school enrollments increased by 11%. The residential school system was unique in experiencing a 2% loss in student enrollment over that reported in 1966.

d. Of the students 39% used braille in 1969 compared to 46% in 1966. The percentage using large type remained static at 36%. The percentage of students reported making at least some use of ink print rose from 11% in 1966 to 15% in 1969. Auditory readers increased from 2 to 5%.

e. The general trend continues to be towards increased use of residual vision. Especially within the higher visual levels, the percentage of braille students has decreased while the proportions of students using large type and regular ink print media have increased. School system biases toward use of certain media regardless of the visual characteristics of the population served still appear.



f. The numbers of students categorized as ungraded are still increasing at a rate of about 50% over each three-year reporting period. Twelve percent of children were assigned to the category in 1966 as compared with 19% in 1969. These increases appear to reflect increased emphasis on ungraded programs in the schools. This research was conducted by Carson Nolan and Joan Bott.

### Schools Collaborating in Research during the Year

Residential schools providing subjects for study included Arkansas, New York (Batavia), Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Nebraska, North Carolina, Ohio, South Carolina, Tennessee, and Western Pennsylvania. One hundred fifty-nine institutions having programs for mhvi answered the questionnaire. Additionally, data were collected at the Indiana Agency for the Blind and the Kentucky Industries for the Blind.

### Publications

Brothers, R. J. Aural study systems for the visually handicapped: Effect of message length and frame of reference upon learning. Doctoral dissertation, George Peabody College for Teachers, 1970.

Arampatta, D. Illustrations in social studies textbooks as they affect the visually handicapped. Specialist in education paper, George Peabody College for Teachers, 1970

Franks, F. L., & Nolan, C. Y. Development of geographical concepts in blind children. Education of the Visually Handicapped, 1970, 2, 1-7.

Leach, F. W. A survey of the educational needs of multi-handicapped visually impaired children and implications for the development of educational materials. Doctoral dissertation, Southern Baptist Theological Seminary, 1970.

Nolan, C. Y., & Morris, J. E. Learning by blind students through active and passive listening. Exceptional Children, 1969, 36, 173-181.

Umsted, R. G. Improvement in braille reading through code recognition training. Doctoral dissertation, George Peabody College for Teachers, 1970

### Research Personnel for Fiscal 1970

Arampatta, Dharmasena, MA - EMR & D Intern (summer 1970 only)

Baird, Richard, BA - EMR & D Intern (part time)

Bott, Joan, BA - EMR & D Assistant (resigned September 1970)

Brothers, Roy, MS - Behavioral Research Intern (terminated June 1970)

Caton, Hilda, Ed. Spec. - EMR & D Specialist (started June 1970)



Coy, Ken - EMR & D Technician

Franks, Frank, Ed. Spec. - Senior EMR & D Specialist

Hart, Karen - EMR & D Assistant (summer)

Leach, Fay, MA - EMR & D Specialist (EdD work completed in September 1970)

Morris, June, MS - Behavioral Research Associate

Nolan, Carson, PhD - Coordinator; Educational Research, Development and Reference Group

Pohlman, Jeanne - Typist (summer)

Umsted, Richard, ME - EMR & D Intern (resigned June 1970)

#### Staff Additions for Fiscal 1971

Berla', Edward, PhD - Behavioral Research Scientist

Brothers, Roy, EdD - Behavioral Research Scientist

Huff, Roger, MS - EMR & D Assistant

Kederis, Cleves, MA - EMR & D Specialist

Murr, Marvin, BA - Behavioral Research Assistant

Pester, Eleanor, BA - EMR & D Intern

Riley, Judy - Secretary

#### Consultants for Fiscal 1970

Bettinger, Annette - New York State School for the Blind

Foulke, Emerson - University of Louisville

Gissoni, Fred - Kentucky Department of Rehabilitation

Gore, George - Michigan State University

Lown, Arthur - Atlanta Public Schools

#### Mathematics Institute Participants

Bruce, Robert - Virginia School for the Deaf and Blind

Davidow, Mae - Overbrook School for the Blind

Evancic, Tony - Western Pennsylvania School for the Blind

Howser, Dixie - Kentucky School for the Blind

Kopecky, Daniel - Texas School for the Blind

McCracken, Ralph - APH

Sachs, Mrs. Harold - BOCES, Nassau County, New York

#### Science Institute Participants

Evancic, Tony - Western Pennsylvania School for the Blind

Holmes, Isabella - Atlanta Public Schools

Huckins, Ross - California School for the Blind

McCracken, Ralph - APH

Tortora, John - Lavelle School for the Blind

Santana, Jose - New York Institute for the Blind











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## Educational Research, Development, and Reference Group

### Report on Research and Development

#### Activities - Fiscal 1971

Fiscal Year 1971 found our research effort fully staffed with a broad set of objectives clearly defined for the year. The bulk of this report will describe these objectives and our varying success in achieving them.

Attainment of staff and program definition provided more time to concentrate on efforts to maximize the efficiency of utilization of material and personnel resources and to insure a higher level of quality control in our research and development activities. These efforts have resulted in some progress and will be continued through Fiscal 1972. Additionally, it is planned to explore ways to provide for more effective overall program review when such planning takes place in the spring of each year.

Examples of increased efficiency are exemplified by the organization of our research library under the direction of Amie Dennison and the automation of our research data processing through Edward Berla'.

Our newly established research library is well underway with its chief purpose being the facilitation of the efforts of the APH professional staff. Furniture has been purchased, some 200 books have been placed in the open shelf collection of titles, and periodicals have been arranged for interim usage.

This year, 206 volumes of periodicals have been permanently bound and 100 book titles added to the collection. All these have been processed and entered in our permanent card catalog. Twenty-five periodicals are received regularly and a file of pamphlets is maintained.



In the past, almost all of our data analyses have been performed by hand. This past year we were able to begin using our IBM 7040 for our statistical data analysis. The University of Cincinnati kindly donated a number of statistical programs which were adapted to our computer system. In addition, a number of computer programs were written specifically. The adaptation of existing programs and the writing of new programs was carried out by Mr. John Siems of our Data Processing Department. We now have most of the analysis of variance programs necessary for our data processing and we hope to expand our library of programs during the ensuing year to include a wider variety of statistical analyses such as multiple regression analyses and analysis of co-variance.

We are also in the process of evaluating a portable, high-speed, programmable electronic computer for possible purchase. This computer will permit us to carry out a wide variety of statistical tests in 30 to 60% less time than had previously been the case using a calculator. In addition, these statistical tests can now be performed automatically by anyone with a minimum of instruction from our statistical staff.

The growth in the numbers of teachers and others outside APH who are active participants in our research projects has been particularly gratifying. Most of these persons, whose efforts have strongly bolstered our own, are listed at the end of this report. Our internship program will be continued during the coming year as we add Suella McCrimmon of George Peabody College for Teachers to our roll of interns. A new mode of teacher participation will be added when Margaret Yick, an itinerant teacher from the Portland, Oregon schools, spends most of her sabbatical year with us.

### Progress in Specific Research Activities

#### A. Aural Study Systems for the Visually Handicapped

This project, which is funded by the U. S. Office of Education, has gone into its fourth and final year. The project is based on the hypothesis that listening is superior to reading braille or large type for learning many school subjects. The ultimate aim of the project is to be able to present to the educator evidence relative to the use of recorded material in formal study and at the same time present him with a finished package of techniques and equipment for this purpose.

Previous annual reports have described how the design specifications for the Aural Study System under development at APH were determined and how a mock-up of the system was built and critiqued. Simultaneously, behavioral studies designed to investigate factors influencing aural learning have been conducted.

During Fiscal 1971 two additional behavioral studies were undertaken and the equipment and materials under development in the project were field tested. Personnel responsible for this research

were June Morris, Roy Brothers, and Carson Nolan. Marvin Murr and Roger Huff assisted. Bob Phelps, of the Talking Book Department at APH, is the project engineer and has had the responsibility for designing and making the equipment that is intrinsic to the system.

### Research Conducted during Fiscal 1971

#### 1. Behavioral studies

##### a. Further study of the effects of a prior frame of reference on aural learning

Four studies of identical design were conducted in this area. They varied only in type of material used and educational level. These were intermediate social studies, intermediate science, high school social studies, and high school science. Grades comprising the intermediate groups were 6, 7, and 8. Grades comprising the high school groups were 9, 10, 11, and 12. Factorial designs featuring independent groups and unequal  $N$ s were used with each study. The purpose of these studies was to follow up on work done by Brothers, previously reported. Specifically, these studies concerned how prior frames of reference affected aural learning. Evidence from the field of perception supports the expectation that a prior frame of reference should enhance learning.

In each study three experimental groups were used; one having no frame of reference, one using a general frame of reference, and the third using a very specific frame of reference. Other major effects under study were type of reading medium used (braille or large type) and grade level.

A total of 484 subjects was used in these studies. Results supported Brothers' findings in that no significant differences in learning resulted from prior use of a frame of reference, either general or specific, in any of the four studies. However, there was a trend for learning scores to increase as the specificity of the frame of reference increased for the social studies material at both levels. The only statistically significant findings from these four studies occurred at the high school level within the social studies condition where braille students learned more than large type students (.01 level) and where student learning was positively related to grade assignment (.05 level).

##### b. Further study of the effects of message length on aural learning

This investigation of message length (ML) and its effect on immediate and delayed recall was part of a continuing effort to determine an effective format for the presentation of aural text materials. Forty high school students participated in the study. Six braille and four large type readers were assigned to each of the four



ML conditions. The conditions consisted of a 24 minute message and the same message divided into four segments of 6 minutes, three segments of 8 minutes, and two segments of 12 minutes in length. Following the presentation of each message segment, students responded to a series of questions based on the part they had just heard. Five multiple-choice items were drawn from each two minutes of the stimulus selection; consequently, the full 24 minutes of content was represented by 60 test items. An effort was made to specify conditions which would demonstrate the effects of ML either on an immediate or delayed recall basis. Within the time limitations imposed by the experiment, the 24 minute ML condition represented the full extension of possible ML conditions. The measure of delayed recall was obtained after a period of three days.

The results supported earlier findings that segmenting the stimulus material in varied ML does not significantly affect comprehension or recall scores when the subjects have equal time to interact with the material. Scores obtained immediately were significantly higher than those obtained three days later, but there was no evidence that ML conditions had any differential effects on comprehension for short or long delays. It was noted that braille readers scored significantly higher than large type readers under the delayed recall condition.

## 2. Field test of the Aural Study System

The equipment and materials of this system include a record player designed to be used for study, an especially designed stereophonic record, a written key relating page number to record part, and a written supplement containing materials previously determined as not appropriate for aural presentation; namely, a table of contents, an outline of headings, spelling lists, study questions, references, bar graphs, a table, graphics, and an index. The written materials used in the field test were in braille. The topic of the recording and its accompanying braille supplement was a unit of South American history taken from a world history book. Four record players were built for use in the field test.

In the first phase of the field test 36 braille students, ranging in grade from 5 through 12, were trained to use the various components of the system. Students spent one class period on four consecutive school days learning and practicing. On the fifth day they were tested. Of the 36 subjects, 35 performed at an acceptable level. Midway through this phase of the field test an electrical circuitry problem was corrected in the players and the training procedure was modified as the students were learning more readily than anticipated.

Twenty-four high school level students who had been taught to use the system in the first phase of the field test also participated in the second phase. Only high school students were used in this phase of the field test as the content of the material was appropriate for students at this level. These students were given one class period of review and

then spent three class periods (one per day) performing study tasks using the system. These tasks included locating and writing out short form answers to study questions, copying quotations verbatim, outlining, and summarizing. Although the quality of the written responses varied over a wide range, all students were able to use the Aural Study System to perform these tasks with no particular problems being encountered. The data collected provides for a comparison of the time required to perform these study tasks using hand and foot controls.

Information acquired from the field test has indicated where minor modifications in the Aural Study System would be desirable. Overall, the results were extremely positive.

#### Research Planned for Fiscal 1972

##### 3. Reference study

Probably the greatest asset of the Aural Study System is its indexing capability. Through use of this, any place on a record can be located quickly. Reference material such as that found in dictionaries and encyclopedias will be recorded for use with this system for three purposes. First, to learn how such material should be indexed for most efficient retrieval; second, to demonstrate the capabilities of the system; and, third, to compare student performance using these same materials in written and recorded form.

##### 4. Cost study

An obvious criterion for the evaluation of any type of educational material is its cost. To date no attempt has been made to estimate the cost of components of the Aural Study System. However, a cost study will be completed by personnel of the Talking Book Department within the next several months.

##### 5. Study methods manual

Readily available on the open market are numerous "How to Study" manuals. These are designed for the student who traditionally studies by reading print. Currently, there is nothing of this type available for the student who studies by listening. Plans for Fiscal 1972 include writing such a manual incorporating implications for study derived from listening research conducted by APH and others. This manual will not be specific to the Aural Study System but will be of more general applicability as it will include tape applications, such as indexing techniques, that would be useful to a blind student using personal readers.

#### B. Program for Basic Research in Tactual Perception

For decades lack of knowledge of the very basic characteristics of tactual perception has impeded progress in the design of educational



materials for the blind. The APH Board of Trustees, recognizing the criticality of this area, set aside an adequate fund to initiate a program of research in Fiscal 1971. The program director, Edward Berla', has spent the initial year in background and pilot work.

### Research Conducted during Fiscal 1971

#### 1. Review of literature on tactual perception

The purpose of the review was to summarize the literature on the active perception of tactual displays and to indicate, where meaningful, the application of these studies to the education of blind children. Over 500 studies have been reviewed on tactual perception for blind and sighted children and adults. Approximately 230 studies were selected for inclusion in a written review. The review has been completed and is presently being rewritten for publication.

#### 2. The orientation of tactual figures in space

Recent research in tactual perception has shown that for both blind and sighted children the absolute orientation of tactual figures is not used as a cue in the perception of shape. However, there is little research on the blind child's ability to orient tactual figures in space. In order to investigate this ability, 72 braille readers from grades 2, 4, 6, and 8 were presented with tactual figures which varied over three levels of complexity. Each child was presented each figure on a rotatable board and asked to remember the directional orientation of the figure on the board. Following an inspection period, the figure was rotated either 90, 180, or 270 degrees from its initial position and the child was asked to re-orient the figure. The results showed that although overall performance was poor, children from all grade levels were able to perform the task at above chance levels. There was a general stepwise increase in accuracy and a stepwise decrease in variability from grades 2 through 8. Statistical analysis of the data confirmed the findings for the trends across grade levels and that the complexity by grade level interaction had no effect on performance. Additional analyses of these data will be carried out during the current fiscal year.

#### 3. Tactual discrimination of shape as a function of physical size and complexity

This study was undertaken in an attempt to determine the appropriate size for embossed geometrical figures to be used in readiness programs. Thirty-six primary level braille readers discriminated histogram-like geometric figures which varied over three size levels (1 inch 2 inch, and 4 inch areas) and three complexity levels (3, 4, and 5 columns). Pair-comparison techniques were used with each subject serving as his own control. Statistical analyses of the results show that children at the primary level were just barely able to perform the discriminations above chance levels, thus indicating that shape discrimination is rather poor

at the primary level. The physical size and complexity of the geometric forms had no significant effect on the level of accuracy of discrimination performance, but both physical size and complexity effected the amount of time necessary to make a discrimination. As both physical size and complexity increased, the time necessary to make a discrimination increased. The largest figures took 24% longer to discriminate than the smallest figures. The most complex figures took 13% longer than the simplest figures. These results suggest that smaller figures at varying levels of complexity can be efficiently employed at the primary level. Observations of the children performing these discrimination tasks suggests that more attention and instruction should be given to appropriate hand and finger movements in tactual tasks. Additional statistical analyses of these data will be carried out during the current Fiscal Year.

#### Research Planned for Fiscal 1972

##### 4. Scanning strategies and techniques in reading and interpreting graphic tactual displays

For a long time, there has been a dire need for research on tactual graphic displays, notably maps, diagrams, and charts. Research has been hampered by both a lack of readable graphic displays and a lack of knowledge on effective strategies and techniques for reading graphic displays. This year a research program will be initiated to investigate factors important in reading tactual displays.

The initial investigation will be divided into two phases. During the first phase skilled blind users of tactual displays will be sent a tactual pseudomap and asked to perform a few simple map reading tasks. Subsequently, recorded telephone interviews will be conducted to obtain information on their techniques and strategies in performing these simple tasks. In addition, users will be asked to give their opinions on the necessary conditions for designing maps and the skills and techniques required to read maps.

During the second phase, information gained from the interviews on scanning strategies, techniques, and map design, will be incorporated in a research design to empirically determine which strategies, techniques, and map designs can be most effectively employed by blind children.

Information from both phases can then be used as a basis for designing better maps and an instructional program for reading maps. During the year, subsequent studies will be carried out based on the outcome of these initial investigations.

##### C. Braille Codes Pilot Project

This project arose as a consequence of deliberations of the Braille Authority and its Advisory Council and their concern with the many braille code problems in the areas of textbook formats, charts and diagrams, mathematics and science, music notation, and computer



notation. A grant was obtained from Social Rehabilitation Services to explore the feasibility of organizing a major research and development program to solve the codes problems. APH was requested to undertake this study.

The procedure employed in the study was to organize small working groups of experts for each of the five areas. During an initial meeting of each group, attempts were made, through group discussion, to pinpoint specific code problems. Following the meetings, recorded transcripts were analyzed to provide lists of problems ordered by logical categories for each area. These lists were sent to the appropriate group members for study. A second meeting of each group was held and the problem lists critiqued and expanded. These activities were accomplished during Fiscal 1971.

During Fiscal 1972, these problem lists will be recompiled on the basis of the outcomes of the second set of meetings. Problems within areas will be interrelated between areas to arrive at an overall list of research problems categorized in terms of relevant factors. These problem lists together with analyses of the feasibility of research for problems in each category will be discussed in a meeting of the Braille Authority and its Advisory Council. Subsequently a final report on research potentials will be written.

The principal investigator for this project is Cleves Kederis who was assisted by a number of personnel from the editorial, data processing, and production operations of APH. Outside consultants who participated in this project are listed at the end of this report.

#### D. Educational Materials Research and Development Supported through the Instructional Materials Reference Center (IMRC)

For several years, a grant from U. S. Office of Education has supported a variety of research and development activities as well as educational materials reference services. The following projects received support from this source.

##### 1. Science program

###### Research and Development during Fiscal 1971

###### a. Primary science laboratory

The purpose of the primary science laboratory is to introduce basic science concepts earlier and more effectively than is now possible. The laboratory will include the instruments, classroom aids, and instructional materials necessary to teach these concepts. A curriculum analysis was conducted to identify basic concept areas covered in primary science textbooks, to develop lists of related vocabulary, and to assemble a series of experiments and activities which can be used to illustrate the concepts. Educational aids in three of these concept areas, the thermometer, the basic cell, and insects, were

developed and field tested in public and residential school programs as a pilot project to determine the feasibility of such a laboratory.

The thermometer was selected because adequate understanding and use of this instrument is essential for satisfactory comprehension of numerous concepts in life science, earth science, and physical science. A tactile dial thermometer for non-vision students previously developed was found to be a practical and effective instrument for teaching basic concepts in temperature and phase changes in matter to such students in grades 4-12. Since the thermometer is introduced in the science curriculum in the primary grades, instruction in its use for young visually handicapped students is essential. A complicating factor in use of this device by young students is the array of symbols embossed on the face of the dial thermometer. It was felt that the use of the dial thermometer could be greatly facilitated at the primary grade level if the identification and discrimination of these symbols could be taught to young students.

The basic cell introduces parts of the cell and emphasizes chromatic and tactual discrimination of likenesses and differences of surface areas. Similarly, the insect unit teaches body parts and encourages inspection of differences and likenesses in tactual models. These aids feature a number of point, linear, and areal symbols which will be used on other materials to be included in the laboratory.

Preliminary field testing indicated that young visually handicapped students in the primary grades can be taught to discriminate and utilize chromatic and tactual cues appearing on these aids. This project was conducted by Frank Franks and Richard Baird. Field testing in public and residential school programs was done by Roger Huff.

#### b. Three dimensional biological models

A set of three dimensional biological models (invertebrates) has been developed which depict, chromatically and tactually, the major morphological features of major invertebrate phyla. Pilot testing to determine the feasibility of developing the set of models has been completed. The colors and textures employed were found highly discriminable. Richard Baird pilot tested these models.

#### c. Linear measurement in primary science

A brief study exploring the use of linear measurement as a frame of reference for teaching and/or reinforcing primary science concepts was made. Study of primary grade science textbooks indicated that linear measurement was not employed as extensively as originally considered. However, a number of important concept areas (e.g., growth of plants, weight of air, evaporation of water) were identified, and model instructional units were written utilizing linear measurement. This study was made by Susulan Sappayani.



## Research and Development Planned for Fiscal 1972

## d. Primary science laboratory

The development/adaptation of a set of simple machines for teaching basic physical science concepts will be pursued. Inspection of primary grade science textbooks confirms the fact that increasing numbers of physical science concepts (e.g., work, energy, friction) are appearing in the primary science curriculum. Although a set of simple machines has been developed for older visually handicapped students, no set of machines is available for introducing basic physical science concepts to young visually handicapped students. Frank Franks and Anthony Biacchi will follow this project to completion. Annette Bettinger, New York State School for the Blind, will provide consultative services on this project.

Final field evaluation of the primary science laboratory to determine its educational validity will be conducted in actual classroom situations. Laboratories will be made available to several programs for the visually handicapped for use in primary science classes and will be evaluated by the classroom teachers who direct their use.

## e. Three dimensional models (plants)

A set of three dimensional biological models (plants) will be developed to introduce the important features of representative plant phyla. A curriculum analysis of current biology textbooks will be made to determine the models to be developed. Preliminary pilot testing of three dimensional models (invertebrates) indicated that color and textural surfaces used on the models are highly discriminable. Final field evaluation of three dimensional models (invertebrates and plants) in biology classes is scheduled for Fiscal 1972. This project will be completed by Frank Franks and Marvin Murr.

## f. Primary science institute

A primary science institute will be held at APH to examine areas where deficits in instructional materials for young visually handicapped students are believed to exist, to identify specific aids necessary for teaching basic concepts in these areas, and to suggest priorities for development of relevant aids and materials. Instructional materials in development at APH which have relevance for primary science instruction will be presented for comment and evaluation during the institute. Additional materials to be included in the primary science laboratory will be discussed at this time. Concept areas which are more appropriate for individual projects will be designated and priorities suggested for their subsequent development. This institute will be coordinated by Frank Franks.

## 2. Mathematics program

### Research and Development during Fiscal 1971

#### a. Primary mathematics laboratory

The purpose of the primary mathematics laboratory is to provide educational aids to facilitate the introduction of basic mathematics concepts to young visually handicapped students.

The first step in its development focused on a textbook analysis at the primary level which identified critical concept areas (e.g., addition, measurement, fractions, etc.), their scope, and sequence of development at each of the three primary grades.

Educational aids were developed for three of these concept areas and were field tested as a pilot project to determine the feasibility of the laboratory. These aids were as follows.

The number line is used extensively in mathematics programs for the sighted in presenting new concepts and building an understanding of numerical relationships in the primary grades. Mathematics educators recommended the development of a number line device at the APH Mathematics Institute for the Visually Handicapped held in 1970. Eleanor Pester, an intern from Illinois State University selected this project for her master's thesis. A prototype was developed and tested at the primary grade level. The testing program was designed to identify a suitable method by which visually handicapped students could manipulate the prototype and discriminate its parts in performing numerical operations. Results of the initial testing verified that primary visually handicapped students could use the number line efficiently. Further evaluation of this device as part of the primary mathematics laboratory will be conducted this year.

The fractional parts of wholes kit was designed to introduce the basic concepts of fractional parts to primary grade students. Emphasis was placed on presenting concepts concretely in as simple language as possible. The kit includes halves, thirds, fourths, and wholes (plane circle). All parts can be nested in formboards. Pilot testing was done in a classroom setting to determine if students at the primary grade levels could use the materials. Preliminary results indicated that students can manipulate the parts and can discriminate readily the fractional parts which have greatest differences in size (fourths and halves), but that younger students have some difficulty in discriminating parts nearest in size (thirds and fourths). Consequently, some revision of these materials may be necessary. Frank Franks and Hilda Caton collaborated on this unit.

The purpose of the tactile ruler unit was to evaluate primary grade students' ability to discriminate and identify the tactual symbols on the inch scale of the tactual ruler and to teach students to



perform simple operations in linear measurement. Curriculum analyses of several sets of primary mathematics and science textbooks indicated that linear measurement tasks are generally restricted to the use of inches at the first grade level, half-inches at the second grade, and fourth-inches at third grade. Although the concept of centimeter is introduced at the primary level, it is not until later that measurement tasks using centimeters appear with much frequency. Results of pilot testing indicated that the young visually handicapped students tested were able to discriminate the point and linear symbols embossed on the ruler. Younger students had more difficulty in discriminating one-fourth inch distances than in discriminating one-half inch distances. Frank Franks and Hilda Caton collaborated on this unit.

#### b. Geometric forms

The feasibility of developing a set of geometric forms to facilitate instruction of geometric concepts in the primary grades has been established during the past Fiscal Year. An investigation was conducted to determine the kinds of geometric concepts taught and the frequency of their occurrence at the elementary level.

A detailed analysis of geometric illustrations appearing in elementary mathematics textbooks (grades 1-6) noting type and frequency of illustrations has been completed. A second analysis of geometric concepts at the primary level was completed noting instructional objectives, concepts taught, and teaching processes. Roger Huff and Marvin Murr were responsible for the analyses done on this project.

#### c. Development of an enlarge abacus

One recommendation from 1970 APH Mathematics Institute was for design of an abacus one-third larger than the Cranmer Abacus. The large abacus was suggested for use by young blind students and others who lack the manipulative skill required for easy manipulation of the small device. Prototypes of an enlarge abacus were developed and sent to classroom and rehabilitation teachers to determine the usefulness of the device in an instructional setting. Particular attention was given to exposing the enlarged abacus to very young blind children and those with additional involvements who experienced difficulty using the Cranmer Abacus. Questionnaires were provided to the teachers for recording their reactions to the device as it was used in the classroom. Results of the survey were favorable and a report of the evaluation has been completed. Roger Huff was responsible for this research.

#### d. Current achievement in arithmetic computation by braille students

The purpose of the study was to determine current computational levels for braille students; to compare such levels of achievement for 1959 and 1970; and to explore relationships between achievement score

and the type of device or computational strategy that was used. The procedures used closely followed those described for the earlier evaluation. Two hundred sixty-nine students in 12 residential schools for the blind were tested. All subjects were braille readers enrolled in grades 3, 4, 6, or 8. In addition to administering the appropriate level of the Stanford Achievement Test (SAT) of arithmetic computation, the testers also reported the device or computational strategy employed by the students.

Achievement scores obtained in 1970 were found to be below those reported in 1959 with median scores for each grade level ranging from four to seven months below previously reported levels. Several interesting relationships were observed between achievement level of the student and the device being used in the computation. Students who used the Cranmer Abacus or the Numberaid consistently obtained higher achievement scores. More specifically, students in the third grade who used the Numberaid scored significantly higher than students using other devices. At the fourth grade level the Numberaid and Calculaid users scored significantly higher than other-device groups with the exception of Cranmer Abacus users. A sixth grade mental arithmetic group scored significantly higher than other-device groups with the exception of those using the Cranmer Abacus. At the eighth grade level the Cranmer Abacus group was clearly superior to all other groups, including those using mental arithmetic; the achievement of this group was 11 to 18 months higher than the other groups. The level of achievement becomes even more noteworthy when the mean IQ of the different groups is considered. The mean IQ of the abacus users was 92.8 which was six points lower than the mental arithmetic group and 13 points below the mean IQ of the braillewriter group.

Research findings support: (a) using the Numberaid or other manipulative device at the third and fourth grade level (b) providing an opportunity for all students to become proficient Cranmer Abacus users, and (c) placing less emphasis on the braillewriter as a computational aid. This research was conducted by Roy Brothers.

#### Research and Development Planned for Fiscal 1972

##### e. Primary mathematics laboratory

The development of a set of geometric forms to facilitate instruction of geometric concepts in the primary grades will be completed. Design and development of prototypes will include raised line drawings, tangible plane figures, and three dimensional figures.

The geometric forms unit is intended as the final unit to be included in the primary mathematics laboratory. It is anticipated that a separate kit of geometric forms for use at the elementary grade level will result from this project. This research will be conducted by Frank Franks and Roger Huff.



Final field evaluation of the primary mathematics laboratory to determine its educational validity will be conducted in actual classroom situations. Laboratories will be made available to several programs for the visually handicapped for use in primary mathematics classes and will be evaluated by the classroom teachers who direct their use. It is hoped that this evaluation will be completed during Fiscal 1972.

f. Development of a simplified compass and protractor

The development of a simplified compass and protractor was recommended by the 1970 APH Mathematics Institute. Commercially available compasses lack a self-contained measurement scale and currently-produced protractors require separate steps to perform simple operations. Adaptation of these devices will be attempted with the design of new devices as an alternative. Several prototypes of each device will be evaluated in programs for the visually handicapped to determine their suitability for use in geometric operations. Frank Franks and Marvin Murr will be responsible for this research.

g. Development of a three-dimensional coordinate aid

This project will develop educational aids which can be used to introduce the third dimension in geometry to visually impaired students. The aid will be used to illustrate intersecting planes, points in space, and three-dimensional coordinate axes. Educational catalogues will be searched for aids that can be adapted to the visually handicapped, and new designs of apparatus will be explored. Prototypes will be evaluated in mathematics programs for the visually handicapped. Frank Franks and Marvin Murr will conduct this research.

h. Programmed instruction for the abacus

For her Educational Specialist's thesis at Peabody, Suella McCrimmon plans to develop programmed material which will provide for independent individual learning of both addition and subtraction on the abacus. It is planned to present the program in recorded form. During the year the writing of these materials will be completed, they will be subjected to expert review, and to evaluation in use with children.

i. Current achievement in arithmetic computation by braille students in local public schools

The survey of arithmetic computation conducted during Fiscal 1971 indicated generally low achievement among braille students in residential schools. However, it was noted that when students used the Cranmer Abacus, Numberaid, or the Calculaid their scores were significantly higher than those of students using other devices or computational strategies. The relationship between achievement and device used was not fully substantiated since less than half of the students were using these devices.

The present study will focus on the arithmetic achievement of braille students in public school programs. Students enrolled in grades 4, 6, and 8 will be tested during February, 1972, with appropriate levels of the SAT. The results will note specific levels of achievement and the extent to which specific devices or computational strategies are generally being used. The results may also provide an impetus for programs that would further the opportunities of braille students to become proficient in abacus calculation. The research will be conducted by Roy Brothers who will be assisted by Roger Huff.

### 3. Social studies program

#### Research and Development Planned for Fiscal 1972

##### a. Introductory map reading materials

Materials will be developed for introducing map reading concepts to young visually handicapped students. Specifically, the materials will be used to expose students to geographical features, to provide general map orientation, and to introduce tactile symbols which will be included in a subsequent study on teaching skills in map reading. Aspects of general map orientation will consider concepts of direction, scale and distance, and spatial relationships indicated and/or implied from curriculum analyses of primary level social studies textbooks and map reading materials. Similarly, the point, linear, and areal symbols employed will be selected from existing sets of highly legible symbols and will be used to indicate concrete features which appear on print maps at the primary grade level. These materials will be developed by Frank Franks and Anthony Biacchi. Ken Coy will construct the experimental materials.

##### b. Simplified continental relief maps

A set of materials will be developed for introducing the continents to young visually handicapped students. A curriculum analysis of primary social studies textbooks and map reading materials will be conducted to identify the kinds of continental maps which appear most often and to suggest design specifications for prototype development. Frank Franks and Anthony Biacchi are responsible for developing these materials. Ken Coy will prepare prototypes of these maps.

##### c. Social studies institute

A social studies institute will be held during Fiscal 1972. The purpose of the institute is similar to that of previous institutes in mathematics and science. The institute will focus on deficits in map reading viewed in terms of needs across the social studies curriculum. Participants will have an opportunity to examine and evaluate map reading mock-ups and prototypes in development at APH and will be encouraged to make suggestions as to their use in the classroom. The institute will be coordinated by Frank Franks and Anthony Biacchi.



#### 4. Low vision training research during Fiscal 1971

##### a. Evaluation of seated parquetry formboards for students with low vision

Parquetry materials consist of different colored triangular, diamond, and rectangular shapes that can be used to copy or create intricately shaped and colored designs of varying complexity. Such materials are widely used in programs designed to teach children to compare and discriminate forms and colors. Use of these materials by handicapped children is complicated by the high probability of accidentally disrupting a design before it is completed. To avoid this problem, recessed representations of the patterns to be copied were developed in which the pieces making up a pattern could be seated. The recess is deep enough so that the seating board must be turned almost vertically before the pieces will fall out or become disarranged. Eight parquetry patterns, recessed boards, and necessary forms to copy the patterns created for possible use in the low visual function training program were evaluated.

As part of the evaluation, 231 visually handicapped children were individually observed by 31 teachers. The students were enrolled in grades one through twelve in either residential or public school programs in one of seven states. Descriptive information obtained on each student included: age, IQ, grade level, reading level, reading mode, and prior experience with parquetry. However, the major focus of the study was on actual use of the materials. Observations of student performance reported on appropriate forms concerned: use of near vision, manipulative approach, and preferences for certain designs or materials. To provide some structure for the observations, each student performed a prescribed series of parquetry tasks and was then allowed to use the materials in an unstructured situation with behaviors reported for both conditions. A second form was completed by each teacher-observer following completion of all student observations. This form provided each respondent with an opportunity to give his overall impressions of the materials and to make specific recommendations for adaptation or change.

Results indicated that the materials were most appropriate for those students in the primary and early intermediate grades. The intent and purpose of the materials was also supported in that preference for the formboard was associated with students having lesser amounts of vision. In the opinion of the observers, the use of formboards eased the student's manipulative task and also contributed to the development of independent work skills. It now appears the production of parquetry materials should include stimulus cards and formboards. Such a combination of materials would be educationally sound and would be generally welcomed by teachers of low vision children. This evaluation was conducted by Roy Brothers.

## 5. Materials for the multihandicapped visually impaired

### Research Conducted during Fiscal 1971

#### a. Development of simplified readiness aids

Five copies of the directional concept board, the peg frames, and the large textured blocks were placed for field testing with four organizations. An evaluation form was developed along with a guide for use of these aids. Follow-up visits were made to three organizations. A report on possible changes and improvement has been written and is now under consideration. Fay Leach was responsible for this research.

#### b. Survey of available recorded materials for development of language skills

A 48-page report entitled "Commercially Available Recorded Instructional Materials for the Development of Communication Skills" was completed by Fay Leach. Over 1,200 copies have already been distributed in 1971.

#### c. Adaptation of the "Listen and Think" materials

Level C of this program by Educational Developmental Laboratories (A Division of McGraw-Hill) is now in the final production stages. The adapted program can appropriately be used by students in grades 3-6, depending on their abilities. Materials provided in the adapted program are:

- Fifteen Revised Taped Lessons (cassette or reel)
- Braille and Large Type Answer Sheets
- Plasti-Crayons
- Tape: "How to Use Your Answer Sheet"
- Braille and Large Type Progress Charts
- Marking Pins
- Teacher's Handbook
- Suggestions for Use of the Adapted Programs

Only a minimum of braille or print skills are required for this series of lessons; therefore, students who are not proficient in reading and writing braille or print may participate.

More than 150 students with visual handicaps participated in evaluations of the format revisions. Length of time required for responses, use of a sound cue, use of the answer sheet and other auxiliary materials, lesson format, amount of feedback required, and difficulty of the materials were tested and evaluated. After pilot testing, the program format was revised two times and each time tested with students to assure that improvements were adequate. This adaptation and evaluation was made by Fay Leach.



## Research to be Conducted during Fiscal 1972

### d. Basic auditory and oral language skills

Emphasis is to be given to the facilitation of the development of basic auditory and oral language skills of visually handicapped students, giving special consideration to the problems of the multihandicapped. This was a critical area of need pinpointed by the APH study of the needs of multihandicapped visually impaired children.

Three units of Educational Developmental Laboratories "Listen and Think" tape lesson series (in addition to Level C) are to be adapted. A survey of suitable commercially available materials is to be made and used as a basis for providing information for educators. An exploration of the feasibility of the development of an instructional materials manual is to be made. Specifications for prototypes should evolve out of these studies. This work will be performed by Fay Leach.

### e. Basic readiness skills

Emphasis on materials for basic readiness skills is to be focused on multihandicapped and/or students who function on a preschool level. An indexed listing of currently available materials is to be completed. Models of eight readiness aids (Directional Concepts Board, Peg Frames, Simplified Blocks, Large Button Aid, Buckle Aid, Textured Blocks, Peg Wagon, and Take-Apart Doll) are to be evaluated in field tests. Biodynamics, Inc. has developed an Instructasette System, a multimedia teaching device using an audio card reader. This device is to be evaluated using program material prototypes to be developed by APH for use with this equipment. Fay Leach will be responsible for this activity. Ken Coy developed the models.

## 6. Development of primary braille reading materials

### Research Conducted during Fiscal 1971

#### a. Primary braille reading institute

During November six educators with extensive experience in teaching braille reading in both residential and public school programs were invited to APH to participate in a three day institute. The purposes of the institute included identification of problems in teaching primary braille reading, making recommendations concerning needed materials and setting priorities for attacking problems identified and for development of materials. This institute was coordinated by Hilda Caton. The outside participants are listed at the end of this report.

Among recommendations made by the group were those for development of a comprehensive readiness program, development of sets of objects to help teach specific concepts of reading, development of worksheet materials to replace primary workbooks now published by APH, production of word cards

developed from the Dolch Word Lists, and development of pre-primer and primer materials programmed according to the difficulties of the braille code.

Participants of the institute agreed to act as members of a consulting group to assist APH staff in carrying out the recommendations.

b. Design of a developmental readiness program

Development of a readiness program was given highest priority by the APH Primary Braille Reading Institute. It was recommended the APH work with Mrs. Ina Kurzhals to formalize her developmental readiness program for trial publication. As presently visualized, this program consists of a teacher's guidebook giving overall description of the program, a set of approximately 60 lesson plans representing carefully integrated readiness activities, and sets of readiness books designed to introduce children to this medium. Preparation of the former two items for field use was brought nearly to completion during the year by Mrs. Kurzhals with the assistance of Hilda Caton and Eleanor Pester. Ken Coy began construction of several sets of the readiness books

c. Analysis of pre-primers and primers

Two recommendations of the institute were for the development of object sets to help teach concepts involved in early reading and worksheets to replace and/or supplement primary reading workbooks. In order to identify the concepts presented in pre-primers and primers as well as identify reading skills and braille areas for which worksheets are needed, analysis of five series of primary readers was undertaken. This work, done for the most part by members of the primary reading consulting group, was coordinated by Hilda Caton.

Research Planned for Fiscal 1972

d. Developmental readiness program

When complete in October, this program together with its associated materials will be sent to five primary reading teachers for detailed review and criticism. These reviews will be used to modify the program for more thorough field testing during Fiscal 1973. Cleves Kederis will coordinate this work.

e. Development of object sets

As part of the textbook analyses mentioned above, teachers will identify points in each reading series where objects could be used to illustrate concepts or replace illustrative material. An attempt will be made to generalize these findings across the five series, develop sets of objects for these purposes, and write teachers guides to their use. Cleves Kederis will coordinate this with the help of Suella McCrimmon.



#### f. Development of worksheets

Seat work in the form of separate worksheets was requested by our reading consultants. During the coming year, it is planned to expand the Touch and Tell Materials in this fashion to a point where the student is taught to discriminate the tactual forms that compose the braille code. This work will be conducted by Cleves Kederis.

### 7. Other IMRC educational materials research and development

#### Research Conducted during Fiscal 1971

##### a. Use of a dissectable doll to teach body image concepts to young children

One of the readiness materials suggested earlier by consultants was a dissectable doll to be used to teach the names of body parts and their relations. Don Walker of the University of Virginia volunteered to undertake this research as a doctoral project. He designed a training program of 20 sessions each of 15 minutes duration. Ten copies of the trial dolls were completed by Ken Coy. Forty blind kindergarten students participated in the study, half receiving training and the other half serving as controls.

It was concluded that the highly structured program of individualized training in body image was an effective means of teaching. The training appeared to be most effective for use with children without useful vision whose IQ scores were below 80. The dissectable doll, when used with the structured training program, appeared to be a useful aid. However, the specific models employed exhibited so many defects in design that the doll needs complete redesign before further use of it is made.

##### b. Evaluation of microfiche displays for large type use

Microfiche are small cards of clear film upon which it is possible to place the negative or positive images of 60 or more regular book pages. These images are read on a viewer which optically enlarges the images and projects them on the reverse side of the viewing screen. By varying the optics and screen size, large type images can be achieved. This system offers a partial solution to the large type book short run problem since material can be easily and inexpensively prepared in this medium. Work on the problem during the year has been restricted to searching for an adequate viewer which was both portable and relatively low in cost. To date this search has been unsuccessful. Carson Nolan was assisted by Marvin Murr in this work.

##### c. Study of the Ednalite Masterlens

The usefulness of an early model of this magnifier as a reading aid for legally blind children was explored this year in both public and residential school settings. Results of these tests indicated the device

had limited usefulness but identified a number of areas for possible improvement in design which were passed on to the manufacturer. Carson Nolan, Amie Dennison, and June Morris participated in this study.

d. Study of the Phylab-braille

This is a device which coupled with certain models of manual or electric typewriters reproduces on a paper tape a grade one braille version of the typed material. The braille was evaluated at three residential schools through trial use by students and faculty. It was found to have a number of design problems, to be of limited usefulness, and in consequence to be relatively high in cost. It was concluded that no further study or development of this device should be undertaken by APH. Carson Nolan was responsible for this exploratory study.

Research Planned for Fiscal 1972

e. Identification of teacher competencies needed for the education of visually handicapped children

The use of educational materials with visually handicapped students requires that teachers have a rich background in educational practice. While general competency may be assumed with special education training and teaching experience, situations might develop in which rather specific types of information or skills are needed to maximize the use of a certain strategy or material aid.

The purpose of the present investigation is twofold: (1) To determine the extent to which teachers need to develop additional competencies, and (2) to explore possible strategies that might be used to meet those needs identified in the general areas of reading, listening, mathematics computation, and the use of low vision aids. Roy Brothers and Carson Nolan will conduct the investigation.

f. Listening strategies for perceptual motor learning

Results of listening research have indicated many students are now using recorded materials to maximize their study effort. Listening effectively infers a readiness on the part of the student for learning which may be affected by the variety and range of his experiences with auditory stimuli. Early development of accurate sound localization skills serves as a prerequisite to a conceptualization of the environment and the development of an aural awareness.

The proposed study will identify sounding devices and explore specific teaching techniques which influence the perceptual-motor abilities of young blind children. Roy Brothers and Roger Huff will conduct the investigation.



Agencies Collaborating in Research during the Year

Fiscal 1971 saw a record number of outside schools and agencies collaborating in our research and development efforts. These included the following residential schools for the blind: Alabama, Arkansas, California, Colorado, Florida, Georgia, Governor Morehead, Indiana, Iowa, Kentucky, Lavelle, Maryland, Michigan, Missouri, New York (Batavia), Ohio, Oregon, Overbrook, Perkins, Tennessee, Texas, Utah, Virginia (Staunton), Washington, Western Pennsylvania, West Virginia and Wisconsin. Public schools in the following systems participated: Boston; Chicago; Duval County, Florida; Montgomery County, Maryland; Nashville, Tennessee; Philadelphia; Portland, Oregon; St. Louis County, Missouri, as well as schools in the following Districts in California, Alum Rock Union, Berkeley Unified, Campbell Union, Castro Valley Unified, Cupertino Union, Oakland Unified, San Jose Unified, and Walnut Creek. Other organizations participating included Arkansas Enterprises for the Blind, Little Rock; Callier Hearing and Speech Center, Dallas; Georgia Center for Multi-handicapped Deaf-Blind, Atlanta; Kansas Rehabilitation Center for the Adult Blind, Topeka; Kentucky Industries for the Blind, Louisville; and Murdock Center for Blind Multihandicapped Children, Butner, North Carolina.

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- Brothers, R. J., & Dennison, A. L. Evaluation of seated parquetry formboards for students with low vision. Unpublished report, American Printing House for the Blind, 1971.
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- Murr, M. J. Frequency of geometric illustrations in mathematics textbooks, grades 1-6. Unpublished report, American Printing House for the Blind, 1971.
- Pester, E. J. Primary mathematics textbook analysis for tangible apparatus development. Unpublished report, American Printing House for the Blind, 1971.
- Sappayani, S. Using linear measurement to tactually present primary science concepts in grades 1-3. Unpublished report, American Printing House for the Blind, 1971.



Research and Development Personnel for Fiscal 1971

Baird, Richard, BA - EMR&D Assistant (part time)  
Berla', Edward, PhD - Behavioral Research Scientist  
Brothers, Roy, EdD - Behavioral Research Scientist  
Caton, Hilda, Ed. Spec. - EMR&D Specialist  
Coy, Ken - EMR&D Technician  
Franks, Frank, Ed. Spec. - Senior EMR&D Specialist  
Huff, Roger, MS - EMR&D Assistant  
Kederis, Cleves, MA - EMR&D Specialist  
Leach, Fay, EdD - EMR&D Specialist  
Morris, June, MA - Behavioral Research Associate  
Murr, Marvin, BA - EMR&D Assistant  
Nolan, Carson, PhD - Coordinator; Educational Research, Development,  
and Reference Group  
Pester, Eleanor, BA - EMR&D Intern  
Pohlman, Jeanne - Typist (summer)  
Riley, Judy - Secretary  
Sappayani, Susulan, MA - EMR&D Assistant (summer)

Consultants in Primary Level Braille Reading during Fiscal 1971

Mrs. Estelle Hagood, Instructional Supervisor, Texas School for the Blind  
 Miss Freda Henderson, Curriculum Director, Tennessee School for the Blind  
 Mrs. Ina Kurzhals, Acting Principal, Utah School for the Blind  
 Dr. Evelyn Rex, Assistant Professor, Illinois State University, Normal  
 Mrs. Sara Schell, Resource Teacher, Atlanta Public Schools  
 Mrs. Betty Wommack, Instructional Supervisor, Kentucky School for the Blind

Consultants on the Braille Codes Pilot Project

Textbook Format

Mrs. W. D. Earnest, Jr., Chairman, Foreign Language and Treasurer, NBA,  
 New Jersey  
 Dr. George V. Gore, III, Professor Special Education, Michigan State  
 University  
 Dr. Evelyn Rex, Professor Special Education, Illinois State University  
 Mr. Fred Sinclair, Consultant in Education of the Visually Handicapped,  
 California State Department of Education  
 Mrs. Theodore Stone, Member Braille Authority, Textbook Format Advisory  
 Committee, Johanna Bureau for the Blind, Illinois

Mathematics/Science

Mr. Anthony Evancic, Math and Science Teacher, Western Pennsylvania School  
 for Blind Children  
 Dr. Abraham Nemeth, Professor of Mathematics, University of Detroit  
 Mrs. Ruth Peters, Chairman, Area Representative, Math, NBA, Ferndale,  
 Michigan  
 Mrs. Helen Roberts, Member Braille Authority, Math Advisory Committee  
 and Area Representative, NBA, New York  
 Mr. Don Wilson, Math and Science Teacher, Connecticut School for the Blind



Music

Mr. George Bennette, Director, Lighthouse Music School, N. Y. Association  
for the Blind

Mrs. Janice Conard, Braille Music Advisor, Library of Congress

Mrs. Mary DeGarmo, Braille Music Transcriber, California Transcribers  
Association

Mrs. Hortense Foreman, Braille Music Teacher, Tennessee School for the Blind

Mr. Edward Jenkins, Chairman, Braille Authority Music Advisory Committee,  
Perkins School for the Blind

Mrs. Stella Jenkins, Braille Music Teacher, Perkins School for the Blind

Computer

Mr. Harry Bassler, Member Braille Authority Computer Advisory Committee,  
Colonial Penn Insurance Co., Philadelphia

Mr. Robert A. J. Gildea, Member Braille Authority Computer Advisory  
Committee, Mitre Corporation, Bedford, Massachusetts

Dr. Abraham Nemeth, Professor of Mathematics, University of Detroit

Mr. Bernard A. Perella, Member Braille Authority Computer Advisory  
Committee, Department of Defense, Washington, D. C.

Mrs. Ann Schack, Member Braille Authority Computer Advisory Committee,  
Schack Associates, New York

Maps, Charts, Graphs

Mrs. Betty Epstein, Area Representative, Mathematics, NBA, Florida

Dr. Emerson Foulke, Director, Perceptual Alternatives Laboratory, University  
of Louisville

Mr. Harry Friedman, Manager, Howe Press, Perkins School for the Blind

Mr. David Kelly, Science Teacher, New York State School for the Blind

Dr. Joseph Wiedel, Professor of Geography, University of Maryland







# American Printing House for the Blind

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## Educational Research, Development, and Reference Group

### Report on Research and Development

#### Activities - Fiscal 1972

Our educational research and development program continued on a broad scale with projects in the areas of reading, science, mathematics, social studies, listening, educational materials use, braille codes, language development, sensori-motor readiness, and tactile perception. Three years of experience with our broadened program has pointed up our need to more clearly define our objectives and the paths to their attainment. Emphasis will be placed on this task during Fiscal 1973.

During this year, we adopted the system of management by objectives. This procedure should allow for more efficient planning and budgeting in ensuing years as well as allow for allocations of more realistic workloads. Greater emphasis was given to quality control functions during the year. Review procedures were sharpened and quality of evaluation procedures improved. Greater time allocated to evaluation procedures as well as loss of critical personnel impeded our attainment of goals set for the year.

We continued to expand our data analysis capability. Major assistance from the Data Processing Department by Mr. Robert Haynes and Mr. John Siems enabled us to add significantly to our library of statistical programs for our computer. In addition, we purchased a high-speed programmable calculator which enables an unskilled user to carry out a wide variety of statistical tests rapidly, efficiently, and with a minimum of instruction.

Interaction between the research staff and the field reached its highest peak. More than 35 teachers or other educational experts contributed to our projects through intensive consultation. Members of the research staff described our activities at national and regional meetings of the Association for Education of the Visually Handicapped and Council for Exceptional Children. Two papers describing the program were presented at the International Conference for Education of Blind Children and Youth. Individual staff members gave a number of invited addresses throughout the nation and several professional papers were published.

## Progress in Specific Research Activities

In the progress descriptions that follow, the project leader and assistants are identified at the end of each project. Before describing progress on individual projects, the significant contributions of Ken Coy, our educational materials development technician to most projects, should be acknowledged. Mr. Virgil Zickel and various personnel from our plant have participated widely in materials design. Mr. Glenn Scheurich and his staff in the Talking Book Department have been actively and constructively involved in all projects involving recordings. Miss Marjorie Hooper and her staff of the Editorial Department made major contributions to the Braille Codes Pilot Project as well as to other efforts.

### A. Aural Study Systems for the Visually Handicapped

This project was funded through the U. S. Office of Education, Bureau of Education for the Handicapped. All specific aims set forth in the original grant application have been met. These included behavioral studies of learning through listening, a task analysis of the job of learning through listening, and the building of an Aural Study System specifically designed for use by the visually handicapped which was subsequently field tested. Additionally, steps have been taken to apply information acquired through this project to recording equipment currently being produced by the American Printing House for the Blind (APH). Carson Nolan has served as director of this project. Those who worked with him during Fiscal 1972 were June Morris; Roy Brothers; Roger Huff; Bob Phelps, the project engineer; and John Brockman, recording engineer.

### Research Conducted during Fiscal 1972

#### 1. System development and evaluation report

The write-up of the development of the Aural Study System was undertaken during Fiscal 1972. This report will be submitted to the Office of Education as Interim Progress Report No. 9 when it is completed. The report will include the background of the Aural Study System, the way in which its specifications were determined, a thorough description of the first model of the system and the modifications resulting from its critique and in-house review, a report of the cost of building the equipment, and a report of the field test of the system. Additionally, the problems of textbook format and editing, as they relate to recorded editions of textbooks, will be discussed.

#### 2. Manual on how to listen more effectively

One of the primary goals of the Aural Study System project was to provide a manual for use by visually handicapped students containing information on how to study from recorded material. Work on this manual commenced during Fiscal 1972. Information for such a manual was acquired from interviews with visually impaired students who traditionally studied from such materials, from research on listening, and from general "How to Study" manuals. Plans are to record the manual. Such things as suggestic



on how to anticipate the message by selectively reviewing specific parts of the book, how to take and organize notes, and how to use personal readers both for help in studying and in making personal recordings will be included. Currently, no such information is directly available for students who study aurally.

### 3. Reference study

The single most unique and positive feature of the Aural Study System is its indexing capability. It makes possible rapid location of any desired place within a text. This feature makes the Aural Study System appear to be ideally suited for presenting reference material. Two problems with reference materials in large type and braille are that they are cumbersome to use and require a tremendous amount of storage space. For example, in regular ink print the Thorndike-Barnhart Junior Dictionary is contained in one volume of 784 pages. The large type edition requires 11 volumes plus a pamphlet and contains 3344 pages. The braille edition is even larger. It requires 22 volumes and contains 4624 pages. By contrast, estimates are that the entire dictionary could be contained on about 40 12-inch records. These could be stored in less than four inches of space.

In order to test the feasibility of using the Aural Study System as a means of presenting reference materials, two 120 minute selections were recorded. One is from the Thorndike-Barnhart Junior Dictionary and the other is from the World Book Encyclopedia. In both cases indexing cues are alphabetical in nature. Two versions of the dictionary selection were made. The content of both is identical but the indexing information contained on the index track varies. These materials will be field tested during Fiscal 1973.

### Research Planned for Fiscal 1973

#### 4. System development and evaluation report

This report will be completed and published. It is being written by June Morris.

#### 5. Manual on how to listen more effectively

This manual will be completed, recorded, and distributed. Roy Brothers and Carson Nolan are authoring it.

#### 6. Reference study

Use of the recorded selections from the dictionary and encyclopedia will be compared with use of their written counterparts in a field test of the materials. Subjects will include legally blind students from grades 4-12. These students will be given training in use of the Aural Study System and be given a review in the nature of and use of the two reference works. Then, their performance will be compared in terms of time and accuracy when using the recorded and written versions of these materials. The purpose of this study is to determine the more efficient mode for presenting such materials. June Morris is responsible for this project. She will be assisted by Anthony Biacchi.



## B. Basic Research in Tactual Perception

### Research Conducted during Fiscal 1972

#### 1. Scanning strategies and techniques in reading and interpreting graphic tactual displays

The purpose of this study was to determine what strategies and techniques experienced adult blind users employed in reading tactual maps. Twelve blind adults were sent a tactual pseudomap and asked to perform three map reading tasks; namely, to locate five point symbols on the map, to locate six areal symbols on the map, and to follow a dotted track on the map from a starting point to a predetermined goal. While performing these tasks, they were asked to describe their hand and finger techniques. This description was recorded over the telephone. The results showed that the 12 subjects used a variety of strategies in locating the areal and point symbols on the map. Some of the subjects used two hands to scan the map while other subjects used one hand as a reference marker along the side of the map while the other hand scanned the map for the symbols. In all, seven distinctive scanning techniques were described.

For the remaining task of following the dotted track, there was marked consistency between subjects in the technique used. The basic technique was to use two hands. One hand followed the track while the second hand trailed behind acting as a reference marker. Additional information was obtained on hand and finger utilization, orienting maps and frames of reference, measuring and estimating distance, size and shape discrimination, the use of keys, and possible activities for teaching map reading. This research was carried out by Edward Berla'.

#### 2. Training blind students to scan a tactual map

The purposes of this study were three-fold. First, to determine if a brief period of training students on how to systematically scan a map would improve performance beyond that of a group not so trained. Second, to determine which of several different map scanning strategies was the most efficient and accurate from among those used. Three, to determine if use of a reference hand along the side of a map would facilitate the student's ability to locate symbols on the map as compared to a condition in which both hands scan the map. A total of 108 blind students in grades 4-12 participated in the study. Two groups of students were trained to systematically scan a pseudomap using either horizontal or vertical scanning techniques. For each scanning technique, the students were trained to use one hand as a reference marker while the other hand scanned the map and also were trained to scan the map using two hands without the use of a reference hand. A third group of students was not given any training but was required to perform the same task as the trained group. The task consisted of locating as many as possible of 16 target symbols during an eight minute period. The results showed that training was better than no training with students in the vertical scanning condition locating more symbols than students either in the horizontal group or in the control group. In addition, both trained groups were more

systematic and less variable than the control group in terms of errors of duplication. The use of a reference hand only seemed to benefit students using a horizontal scanning technique while students using a vertical scanning strategy performed about equally as well in terms of the number of symbols located with either one hand or two hands. The untrained group, while not being as systematic or locating as many symbols as the other groups, did take significantly less time to perform the tasks than the trained groups. This project was carried out by Edward Berla<sup>1</sup> and June Morris.

### 3. Methods of shape discrimination

A series of studies was conducted to determine and compare the effects of different methods of discriminating tactual shapes upon the accuracy of discrimination performance. A total of 140 students in grades 2-6 participated in the studies. The students were presented with two raised line shapes which varied in type of configuration and complexity. Half of the comparison pairs were identical and half were different. Each student was presented with a pair of shapes and asked to determine whether the shapes were the same or different. Different groups of subjects were required to inspect the pairs of shapes using one of several different methods of exploration.

The first of the studies compared discrimination accuracy of the left vs. the right hand of each of the students. The second study compared a simultaneous method of exploration with a successive method of exploration. For the simultaneous method the student was presented with two shapes, one to the left hand and one to the right hand and was required to explore the left shape with the left hand only and explore the right shape with the right hand only. For the successive method of discrimination the student was presented with a shape-pair and required to explore both shapes using only one hand. The third study compared the performance of students using two different successive methods of discrimination. The first method called the "same hand method of discrimination" required the students to explore one shape during an inspection period using only his preferred hand followed by the exploration of a second shape with this same hand. The second method of successive discrimination was called the "alternate hand method of discrimination" in which the student explored the first shape with his preferred hand and the second shape with his non-preferred.

Preliminary results suggest that for a given student there was no difference between his left and right hand in terms of accuracy of discrimination performance. The results also indicate that a successive method of discrimination is more accurate than a simultaneous method of discrimination. Since the data analysis is not yet complete the tentative nature of these conclusions should be emphasized. The analysis will be completed and a final report written during Fiscal 1973. This research was carried out by Edward Berla<sup>1</sup> and Marvin Murr.



## Research Planned for Fiscal 1973

### 4. Stimulus legibility and symbology

One problem in tactual perception is the lack of knowledge about the variables which determine the legibility of tactual symbols. Consequently, there is a relative scarcity of discriminable tactual symbols to be used for embossed diagrams and maps. Research in this area has mainly focused on attempts to identify from among ink-print symbols those symbols that are most discriminable when embossed for tactual reading. This year research is planned to identify the variables and methods which may lead to principles for constructing symbols. Previous research at APH suggested that for tactual perception the most relevant dimensions are the following: continuous vs. interrupted, regular vs. irregular, thick vs. thin, single vs. double, rough vs. smooth, and high vs. low. Systematic combinations of these dimensions in different configurations may result in patterns that are highly discriminable. Thus, the proposed research will focus on the nature and number of dimensions that will produce discriminable symbols. This research will be planned and conducted by Edward Berla' who will be assisted by Marvin Murr.

### 5. Map scanning techniques II

The proposed project is similar to the one conducted in Fiscal 1972. Students in grades 4-12 will be trained to scan a tactual pseudo-map using one of three different techniques. The three scanning techniques will be: (a) one hand horizontal scan--one hand will be used as a reference marker along one side of the map while the other hand will scan the map from left to right or right to left locating the target symbols, (b) two hand vertical scan--the two hands will be placed at the top of the map next to each other and both hands will scan the map in columns, and (c) two hand asymmetrical scan--one hand will be placed on the top left side of the map and the other hand will be placed on the top right side of the map; the hands will then scan horizontally toward the center of the map until they meet in the middle. Once the hands meet in the middle, each hand will be returned to its respective side of the map and the next horizontal row of the map will be scanned. The students' task will be to locate as many of the 16 target symbols as possible in an eight minute period. The design of the study will consist of pretesting all students on their ability to locate the symbols before training them to use a specific technique. One group of students will not be given any training. This group will serve as a control group and will be asked to perform the same task as the training groups.

The map for this study will be made more difficult than the map used in the previous scanning study by incorporating areal symbols as well as point and linear symbols. The students' performance will be evaluated in terms of three measures: the number of symbols correctly located, the errors of duplication, and time on task. This project will be carried out by Edward Berla' who will be assisted by Marvin Murr.



## 6. Orientation and identification of tactual symbols

Research has shown that blind children have difficulty in identifying tactual figures on the basis of their orientation. This means that blind children have difficulty both in identifying a tactual figure when it is presented in a different orientation and in determining the orientation of a familiar tactual figure. Research reported last year indicated that braille readers are able to reorient tactual figures in space but perform poorly. Consequently, a study will be carried out to determine whether braille readers can be taught to identify figures irrespective of their orientations and/or be taught to identify the orientation of familiar figures. This research will be carried out by Edward Berla<sup>a</sup> who will be assisted by Marvin Murr.

### C. Braille Codes Pilot Project

#### Research Conducted during Fiscal 1972

##### 1. Pilot study

This project arose as a consequence of deliberations of the Braille Authority and its Advisory Council and their concern with the many braille codes problems in the areas of textbook formats and techniques; maps, charts, and diagrams; mathematics and science; music notation; and computer notation. A grant was obtained from Social and Rehabilitation Service to explore the feasibility of organizing a major research and development program to solve the codes problems. APH was requested to undertake this study.

The procedure employed in the study was to organize small working groups of experts for each of the five areas. During an initial meeting of each group, attempts were made, through group discussion, to pinpoint specific code problems. Following the meetings, recorded transcripts were analyzed to provide lists of problems ordered by logical categories for each area. These lists were sent to the appropriate group members for study. A second meeting of each group was held and the problem lists critiqued and expanded. These activities were accomplished during Fiscal 1971.

During Fiscal 1972, these problem lists were recompiled on the basis of the outcomes of the second set of meetings. Problems within areas were interrelated between areas to arrive at an overall list of research problems categorized in terms of relevant factors.

Among the many results of the study was identification of approximately 838 code problems in all five areas. Approximately 160 of these problems were of a perceptual nature requiring sequential long term research. Of the 678 problems, 625 appeared solvable through short-term efforts, principally through methods involving expert judgment. Cleves Kederis and Carson Nolan were responsible for this project.

## Research Planned for Fiscal 1973

### 2. Braille codes refinement and expansion

The purpose of this project is to refine and expand the braille codes for textbook formats and techniques, mathematics and science, music, and computer notation. This development will concentrate on the specific problems in these areas identified through the Braille Codes Pilot Project and will follow procedures suggested in the report for this project and by the Braille Authority and its Advisory Council. These will involve the use of consensus of opinions of groups of experts supplemented with some empirical research to solve approximately 500 code problems identified through the previous research as amenable to short-term solutions. The results of the project will be published as addenda to present code books or will be incorporated in revisions of these. The initiation of this project, which is projected for a four year period, is contingent upon approval of a proposal to the Social and Rehabilitation Service, HEW.

#### D. Educational Materials Research and Development Supported through the Instructional Materials Reference Center (IMRC)

For several years, a grant from U. S. Office of Education has supported a variety of educational materials development activities as well as educational materials reference services. The following projects received support from this source.

#### 1. Science program

##### Educational Materials Development during Fiscal 1972

##### a. Primary science laboratory

This laboratory was initially conceived as a set of from 15-20 items. However, the number of aids actually identified for development or adaptation was fewer than originally anticipated. Consequently, it appeared desirable to consider each aid as an individual project as reported below to facilitate development, manufacturing, and distribution.

The pull-apart cell is an analog presenting tactually the component features of a plant and/or animal cell as it appears in simple drawings in elementary life science textbooks. No such model suitable for use by blind students is known to exist. Further evaluation of this device is required.

The insect identification kit was designed to teach body parts of insects. It also provides an opportunity for the student to observe and to note differences and likenesses in insects. The kit is supplementary to the numerous illustrations in primary grade science texts. An advantage of use of the kit is its immediate availability in a climate and/or time when attempts to obtain live insects might be futile. Evaluation of this kit is complete.



The dial thermometer familiarization unit introduces the component parts of the APH tactile dial thermometer to primary grade students. Starting with grade one, numerous operations using the thermometer are introduced in the science curriculum. Since the tactile dial thermometer included in the Science Measurement Kit was designed for older students, the need for a short training unit to teach the use of this thermometer to young blind students was recognized and has been developed. Further evaluation is required.

Introductory simple machines are needed for teaching basic physical science concepts. A search through catalogs of educational aids from commercial and specialized suppliers yielded one set of simple machines suitable for very young students. This set of simple machines was subsequently acquired for inspection and preliminary adaptations proposed. Currently, these design modifications are being considered by an APH research and development review committee. Subsequent decisions will be made regarding the extent to which the introductory simple machines will need to be modified for use by young visually handicapped students. A progress report summarizing the activities of the development phase of this project has been completed. Frank Franks and Anthony Biacchi conducted this work.

#### b. Three dimensional biological models

Last year a pilot study was conducted to determine the feasibility of developing a set of three dimensional biological models (invertebrates and plants). Initially a set of 12 invertebrate models (schematics) depicting the major morphological features of major invertebrate phyla was developed. Each schematic was vacuum formed in plastic and coded tactually and chromatically. Typical schematics were selected for pilot testing. Results of the pilot testing showed that the various model parts were highly discriminable to visually handicapped students.

A textbook analysis of biological models (plants) was conducted to identify the plant structures illustrated in junior and senior high biology textbooks. Several representative plant structures (root cross-section, root tip, leaf cross section, lower leaf epidermis, bean seed, and woody stem) were selected to be included in the set of biological models.

Eighteen schematics (12 vertebrates and 6 plant structures) were pilot tested using legally blind secondary students. Generally, these schematics were found to be discriminable. However, several prototype modifications were suggested and were made prior to formal testing. A field evaluation of 19 schematics (a flower schematic added) was conducted to determine if blind secondary students could identify the various structures illustrated. Preliminary analysis of these data shows that the biological structures represented are highly discriminable. Frank Franks was project leader on this study with Anthony Biacchi and Marvin Murr conducting the testing.



c. Institute on introducing basic science concepts to primary grade visually handicapped students

The institute was held to inspect component parts of the primary science laboratory, to examine concept areas in science where deficits are believed to exist, to identify aids for introducing specific concepts at the primary level, and to suggest priorities for developing the instructional aids necessary for completing the laboratory.

The pull-apart cell, the insect identification kit, and the dial thermometer familiarization unit were reviewed and subsequently endorsed by the institute. Participants especially liked the pull-apart cell and recommended the development of additional pull-apart models. Additional laboratory components suggested were the light probe, additional plant models and a rain gauge. The light probe was designated as the single highest priority item to be included in the primary science project. Other high priority aids suggested for development include an ecology unit, educational materials relating to family life and human development (sex education), models depicting the stages of metamorphosis, and an improved braille compass. Frank Franks was institute organizer. He was assisted by Roger Huff and Anthony Biacchi. Persons participating in the Institute are named at the end of this report.

Educational Materials Development Planned for Fiscal 1973

d. Introductory simple machines

This set of simple machines; including the lever, the inclined plane, the pulley, and the wheel and axle, will be evaluated. Further adaptations and the evaluation design for field testing will be suggested by an APH research and development review committee. Frank Franks is the project leader on this study. He will be assisted by Anthony Biacchi.

e. The light probe

A feasibility study to determine whether the light probe can be used to perform a variety of simple chemistry-oriented experiments at the primary grade level will be conducted. A number of educators believe that the light probe can provide the non-vision student direct interaction in a number of concept areas which at present are not available to him. Light probes will be sent to six primary science teachers for evaluation. The participating teachers will be requested to specify simple experiments and concept-oriented activities which their students have been able to perform. Frank Franks is project leader.

f. Pull-apart cell

Further evaluation will be accomplished by Roger Huff.

g. Dial thermometer familiarization unit

Further evaluation will be completed by Roger Huff.

## 2. Mathematics program

### Educational Materials Development during Fiscal 1972

#### a. Primary mathematics laboratory

Several sets of aids for introducing basic mathematics concepts to young visually handicapped students have been developed under the project title of primary mathematics laboratory. As in the case of the science materials, it subsequently has been decided to consider each aid as an individual project to expedite development and distribution.

The fractional parts of wholes prototype was designed as a tactile analog to parallel educational materials available to sighted students. As a result of last year's pilot testing, modifications were made in the evaluation plan. Field testing was conducted to determine if primary level (K-2) tactile learners could successfully manipulate and discriminate the component parts of the aid. The results of the testing indicated that primary level students could successfully manipulate the fractional parts of wholes and discriminate a majority of the fractional comparisons presented in the evaluation. The project has been reviewed and a final report has been prepared. This evaluation was completed by Roger Huff and Frank Franks.

The original purpose of the tactile ruler unit was to evaluate primary grade students' ability to discriminate and identify the tactual symbols on the inch scale of the tactual ruler and to teach students to perform simple operations in linear measurement. The results of pilot testing indicated that the young visually handicapped students tested had difficulty discriminating the one-fourth inch distances. Consequently, the materials were redesigned this year to overcome this problem. Roger Huff supervised this work.

The geometric forms unit was designed to introduce the shapes of triangles, squares, and circles which are represented in the primary mathematics curriculum as curves, tangible plane figures, and three dimensional figures. Prototypes of the geometric forms have been developed and pilot testing of these materials has been conducted. Results of the pilot testing indicate that further evaluation of these geometric forms is warranted. Roger Huff conducted the pilot testing.

#### b. Compass and protractor; 3-dimensional coordinate aid

These projects were included as research and development strategies for Fiscal 1972. The loss of a staff member resulted in a shifting of strategy assignments. Project development priorities subsequently changed causing these two projects to be deferred indefinitely. There is no progress to report on these two projects.

#### c. Arithmetic computation: Achievement levels of visually handicapped students in public schools

The purposes of the study were to determine current achievement of visually handicapped students in the area of arithmetic computation, to



determine the devices or strategies being used by the students, and to note any relationship between the device and the level of achievement.

Forty-two independent school districts in 10 states participated in the study. Approximately 37% of the 263 students used braille as their reading mode. Appropriate levels of the Stanford Achievement Test, Form X, Arithmetic Computation were administered to students in grades 4, 6, and 8. Achievement scores were higher than those reported for residential school students, and the mean IQ scores of the present sample were 2 to 10 points higher at respective grade levels.

Achievement scores were significantly below expected levels. Mean grade scores were 2 to 9 months below expected grade level, and the percentage of students scoring below the median in grades 4, 6, and 8 were 60%, 67%, and 61%, respectfully.

Use of the abacus was limited. It was not used by large type students in grades 6 and 8 and was used by only a relatively small percentage of braille students (i.e., 9% of the fourth graders, 3% of the sixth graders, and 3.5% of the eighth graders). Braille students appeared to rely heavily upon the braillewriter and cubarithm slate and cubes. Large type students generally used pencil and paper for computational purposes. Mean achievement scores of the two groups were not significantly different. This research was conducted by Roy Brothers.

d. Programmed instruction as a means of teaching addition and subtraction on the abacus

Development and evaluation of programmed instruction to teach addition and subtraction on the abacus was the goal of this project. A series of 45 lessons in programmed format was developed for this purpose. However, it was found impossible to provide for individualized independent use of the program by the student. Instead a tutorial approach was necessary to teach the program for evaluation. The trial use of the program proved moderately successful. The completed program should be useful as a guideline to teachers. This project was conducted by Suella McCrimmon.

Educational Materials Development Planned for Fiscal 1973

e. Tactile ruler

Additional evaluation of this project has been proposed. Roger Huff will conduct this research.

f. Geometric forms

Field evaluation procedures for this project will focus on refining the evaluation design, refining the instructional program to be used, and evaluating the instructional effectiveness of this aid. Roger Huff will conduct this research.



### 3. Social studies program

#### Educational Materials Development during Fiscal 1972

##### a. Introductory map reading materials

The purpose of this project is the development of materials which will assist the young visually handicapped student in the attainment of a map concept (i.e., how the environment can be represented abstractly in the form of a map) and to familiarize him with some of the fundamental characteristics of maps. The need for such materials was identified in an APH report of a five year study on improvement of tactual symbols for blind children.

Simple relief maps of increasing difficulty which present geographical features commonly illustrated on introductory maps have been developed. The contents of these maps are a result of inspections of various social studies textbooks and map reading materials to determine the kinds of maps first introduced in the curriculum, the concept-related activities introduced at the primary grade level, the sequence of introduction, and the appropriate vocabulary used at the primary grade level. The relief maps are curriculum-based analogs which present the same kinds of information found on introductory maps in primary grade level texts. The maps expose the student to physical (e.g., hill, river, tree) and cultural (e.g., house, church, school) geographical features representative of a typical environment, introduce spatial relationships as simple locational referents (e.g., far, near, left, right, between), and provide general map orientation using cardinal (e.g., north, south, east, west) and intermediate (e.g., northeast, southwest) directional referents.

An instructional program was prepared and together with the relief maps was reviewed within APH as well as by teachers attending an Institute on Map Reading for Primary Grade Visually Handicapped Students. The instructional program was subsequently revised and a pre- and posttest was developed. These materials, along with the relief maps, again are being evaluated for testing by an APH research and development review committee. Frank Franks is project leader. He is assisted by Anthony Biacchi.

##### b. Simplified continental relief maps

The purpose of this project is to develop simplified continental relief maps for use by primary grade visually handicapped students. Specifically, the study focuses on physical geography--identification of the most prominent geographical features on continents. A simplified continental relief map of North America was developed for use as a working model in exploring the feasibility of developing maps of other continents. These maps are being explored as analogs to present tactually the kinds of information which is presented visually on maps appearing in the primary grade social studies curriculum.

A working paper on prominent geographical features which appear on continental maps has been prepared as an aid in the development of simplified continental relief maps. The report includes an analysis of prominent geographical features of the continents which appear in the primary social studies curriculum, student identification sheets which may

be of value in testing or teaching the identification of continents and the location of prominent geographical features, and instructional units (grades 1-3) using the continental relief map of North America which may give the educator an idea of how such maps can be used to expand the use of the globe and introduce the use of continental maps into the primary social studies curriculum for young visually handicapped students.

The Institute on Map Reading for Primary Grade Visually Handicapped Students reviewed the project and made constructive comments. A project draft, a mock-up of a simplified continental relief map of North America, and a student identification sheet have been prepared for in-house review. Frank Franks is the project leader. He was assisted by Liborio Albano.

c. Institute on map reading for primary grade visually handicapped students

The Social Studies Institute focused on deficits in map reading viewed in terms of needs across the social studies curriculum, with emphasis on the introductory or primary grade level. The institute was asked to review the APH introductory map reading project and the simplified continental relief map project.

Other curriculum areas in social studies also were examined to determine where deficits in instructional materials are believed to exist for visually handicapped students, to identify specific aids necessary for teaching basic concepts in these areas, and to suggest priorities for development of relevant educational aids and materials.

The introductory map reading projects reviewed by the institute were supported in content and approach. Participants emphasized that there is an immediate need for these aids since materials which teach the concepts introduced are not available for young visually handicapped students.

The institute recommended that APH braille atlases be improved, that individual desk-size outline maps be developed, and that the utilization of cassettes for appropriate instructional materials should be considered. The development of educational models which can be used in conjunction with real features and items in the environment was recommended. Frank Franks was institute organizer. He was assisted by Anthony Biacchi and Roger Huff. Persons participating in the institute are identified at the end of this report.

d. Analysis of map content in fourth grade social studies textbooks

An analysis of maps in social studies textbooks was conducted to guide future development of map reading materials. The variety and the type of physical and cultural symbols found at the fourth grade level were reported. The analysis listed the number of specific symbols (e.g., areal, linear, and point) and the items (e.g., symbols plus keys, scale of miles, etc.) on individual maps. The content (e.g., political, physical, etc.) of the maps and the most frequently appearing symbols were also noted. Anthony Biacchi conducted this analysis.



## Educational Materials Development Planned for Fiscal 1973

### e. Introductory map reading materials

The introductory map reading materials described in 3a (above) will be field tested. Frank Franks is project leader and will be assisted by Anthony Biacchi.

### f. Simplified continental relief maps

The simplified relief map described in 3b (above) will be completed and field tested. Frank Franks is project leader on this project.

## 4. Materials for the multihandicapped visually impaired

### Educational Materials Development during Fiscal 1972

#### a. Adaptation of the "Listen and Think" materials

These materials were designed to provide taped lessons for the development of listening and thinking skills. Level C of this program by Educational Developmental Laboratories (A Division of McGraw-Hill) was completed and is now in production. Level F was adapted and field tested. Master tapes for Level F are now ready to be submitted for production. The adapted lessons incorporate the ink-print workbook activities into one recorded tape and utilize a simple answer sheet format for student response. Fay Leach was responsible for this project.

#### b. Readiness aids

Eight readiness aids were evaluated during the past year: Revisions based on field testing of the simple textured block were completed and a prototype was submitted for production. These blocks are designed with three simple textures and three colors. A frame is provided to assist in manipulation skills. Field testing of the large button aids and the buckle aid did not give sufficient support for production of these aids. The enlarged size increased manipulation problems for some children and for others training on this size failed to generalize to the dressing skills desired. Model revisions have been made in a peg set and a sensory-cylinder set. Both items deal with basic sensory discrimination. Further testing, refinement, and review is needed on the peg set and sensory-cylinders. Due to the availability of similar items on the commercial market, work on the directional concept board and the wagon was discontinued. The take-apart doll is to be reconsidered when information is available from additional testing. This work was directed by Fay Leach.

#### c. Survey of materials for the development of elementary readiness skills

An 87-page report entitled "Commercially Available Instructional Materials for Use in the Development of Elementary Readiness Skills in Young Visually Handicapped Student" was compiled. Nearly 2,000 copies had been distributed by August 1972.



In cooperation with the Area Center for Services to Deaf-Blind Children, Callier Hearing and Speech Center, Dallas, Texas and with the assistance of the Audio Visual Department of the Louisville Public Schools, two copies of a set of video tapes on sensory stimulation have been made and will be available for dissemination. These tapes deal with both theory and actual demonstration of the use of instructional materials. One set of tapes is compatible with the new (EIAF) 1/2 inch Sony and the other is compatible with the old standard 1/2 inch Sony. Fay Leach coordinated these activities.

d. Instructasette System, Biodynamics, Inc.

This device, a cassette player which has been modified to play and record audio cards without greatly increasing its cost, was examined. The examination revealed limitations in the uses and durability of the system. Due to changes in the organizational structure of this company, a cooperative endeavor in the development of audio-card software became no longer feasible. Machines from three other companies were examined and found much superior in quality. The prices of the other available audio card readers are much higher than the Instructasette system. Experimentations revealed that software could be designed which could be used on all four devices. Fay Leach conducted this evaluation.

e. Exploration of the feasibility of the development of an instructional materials manual on elementary auditory and oral language skills

A survey of materials was made and included in the published listing of elementary readiness materials (see 4c above). Curriculum guides have been collected and contacts have been made with persons working on curriculum materials. Two curriculum guides from organizations working with visually handicapped children are scheduled for completion within the next few months. Final evaluation of the need for a materials manual in view of available materials is to be made in a workshop to be organized during the coming year by Fay Leach.

Educational Materials Development Planned for Fiscal 1973

f. Basic auditory and oral language skills

Two additional units of Educational Developmental Laboratories "Listen and Think" taped lessons are to be adapted. A workshop is to be planned and conducted. This workshop is to be designed to bring together a team of consultants for the purpose of identifying specific problems and needs in the development of basic auditory and oral language skills, outlining goals for meeting these needs and problems (identifying priorities) identifying instructional materials which need to be adapted or developed, and reporting on materials which are available and have proven to be valuable for visually handicapped children. Fay Leach will organize this workshop with the assistance of Tony Biacchi.

#### g. Sensory-motor readiness materials

Monitoring of commercially available materials will be continued in preparation for a 1974 revision of the 1972 elementary materials listing. Development and testing of the sensory-cylinders and peg set are to be completed. A guide for use of these latter materials is to be written. Development of a set of audio cards designed for building basic readiness skills will be explored. This work will be directed by Fay Leach with assistance from Tony Biacchi.

### 5. Primary braille reading materials

#### Educational Materials Development during Fiscal 1972

##### a. Developmental reading readiness program

During the last two years, research personnel have worked with Ina Kurzhals and a group of consultants to formalize her developmental reading readiness program for field use and review. This program consists of a teachers guidebook which explains the origin, philosophy, and methods for implementing the program; 66 sample lesson plans to guide teachers in using the materials effectively; and a set of tactual readiness books to be used by students. During the 1972 fiscal year, the textbook and lesson plans were written, copies were made and placed in the field for review by experts, and the reviews were returned to APH. Revisions based on these reviews will be made. The revised materials will consist of the guidebook, a set of seven small pamphlets containing an introduction to the lesson plans, the lesson plans, and instructions for making the tactual readiness books which cannot be produced by the Printing House. Preparation of these materials for review was completed by Ina Kurzhals and Hilda Caton with the assistance of Eleanor Pester. Consultants in this project are listed at the back of this report.

##### b. Analysis of pre-primers and primers

Pre-primers and primers of four basic reading series were analyzed in order to identify concepts presented and to identify reading skills and braille skills for which readiness worksheets are needed. Data from these analyses were used to identify objects needed to present beginning reading skills, to illustrate concepts or replace illustrative materials. The analyses were completed by members of the primary braille reading consulting group and coordinated by Hilda Caton and Cleves Kederis.

##### c. Development of an object collection

Based on the textbook analyses mentioned above, a set of approximately 200 objects was collected and appropriate housing was designed for the collection. The objects were chosen on the basis of their applicability to the four series of textbooks analyzed. Suggested adaptations of lesson plans using the objects as teaching aids were written to assist teachers in using the collection appropriately. Work on this project was completed by Hilda Caton, Cleves Kederis, and Sara Schell.



#### d. Development of worksheets

Data from the textbook analysis was also used to identify specific braille areas in which worksheets were needed for drill and reinforcement. Lesson plans from the pre-primer and primer workbooks of each of the four textbook series were adapted in order to determine the feasibility of developing worksheets in this manner. Work on this project was done by Hilda Caton, Cleves Kederis, and Sara Schell.

#### e. Primary braille reading institute

Members of the primary braille reading consulting group, which was formed during the primary braille reading institute held in 1970, participated in a second institute held at APH during the latter part of Fiscal 1972. The purposes of this meeting were to review recommendations for the development of primary braille reading materials made at the 1970 institute, evaluate progress made by APH toward the implementation of these of these recommendations, make recommendations regarding plans for future development of these materials, and set priorities for their development.

The group strongly recommended that the Printing House continue development of materials recommended by participants in the 1970 institute. They reviewed materials now under development and made recommendations for revisions which are being implemented. They also set the following priorities for completion of these materials: First, completion of the braille reading readiness program designed by Ina Kurzhals; second, completion of the development of a collection of objects and accompanying manual for teachers to teach beginning braille reading; and third, completion of a set of worksheets designed to provide drill and reinforcement in overcoming problems created by difficulties inherent in the braille code. The institute was coordinated by Hilda Caton. The participants are listed at the end of this report.

### Educational Materials Development Planned for Fiscal 1973

#### f. Developmental reading readiness program

Revision of the reading readiness materials now in progress will be completed in December 1972. The materials will be placed in the field for expert review early in 1973. The completion of the review is projected for April 1973. Additional revisions will then be made. Completion of development of the materials is expected during the summer of 1973. Further development will be supported by other sources than the IMRC. Project leader is Hilda Caton.

#### g. Development of object collection

The collection of objects and the first draft of the manual of suggestions for teachers will be reviewed by expert teachers in late 1972 at which time suggestions for revisions will be made. The collection of objects will be reviewed in terms of the suitability of the models included and unsuitable objects will be replaced. The manual of suggestions for teachers will be reviewed in terms of its usefulness in helping teachers present reading skills to visually handicapped children and in terms of



its applicability to more than one reading series. Following this review, revisions will be made and the complete set of materials will be placed in the field for evaluation early in 1973. The projected date for completion of the evaluation is April 1973. Hilda Caton is project director.

#### h. Development of worksheets for tactile reading readiness

A review of available materials for developing the tactile skills to facilitate braille character discrimination will be completed in January 1973. Specifications for worksheets to provide drill and reinforcement in tactile tasks of increasing complexity and difficulty will be written during February 1973. Worksheets will then be designed and plans for evaluation will be made. Hilda Caton and Tony Biacchi will attempt this development.

### 6. Other IMRC educational materials research and development

#### Educational Materials Development during Fiscal 1972

##### a. Identification of teacher competencies needed for the education of visually handicapped children

The purposes of the study were to determine special competencies needed by teachers of visually handicapped children and to explore training strategies that would assist in the development of these competencies.

A survey approach was used to determine areas of needed competencies. Questionnaires were developed in two forms; one for the administrator and one for the classroom teacher. The items on the questionnaires were reviewed and revised before being distributed to a total of 76 programs. Questions directed to the administrator focused on teacher competencies in the areas of reading, mathematics, science, and social studies instruction. A separate section concerned with listening skills, utilization of low vision, and problems in educational diagnosis was included. Questions directed to the teacher group focused on recent inservice training experiences, the types of information found especially useful, and the type of training or information dissemination that would be more helpful.

Thirty-three or 43% of the administrators returned the questionnaire. In addition 116 of their teachers also responded to the teacher's form. A list of needed competencies were identified for each area of instruction as well as the listening, low vision, and diagnostic aspects of instruction. Each list contained anywhere from 50 to 65 individual responses. The listings were highly variable with no strong grouping of related skills emerging in any one area. One exception might be in the area of mathematic instruction where 26% of the total responses were concerned with developing the teachers ability to use and to teach the use of the abacus.

At the present time no formal plan has been adopted which will satisfy the second purpose of the study, namely, the identification of training strategies that would assist in the development of needed competencies. Roy Brothers was responsible for this study.

b. Listening strategies for perceptual motor learning; the development of sound localization skills

The development of sound localization skills by young visually handicapped children is related to characteristics of the sound source, how the sound source is used, and the sequential progression of activities that are adopted. The portable audible goal locator (PAGL) produced by APH is one device identified as having most of the characteristics desired in a stimulus sound for teaching localization skills. The PAGL provides for a varied volume, pitch, and signal frequency. The sound is easily directed and the device is highly portable.

The purpose of the study was to determine how the PAGL was being used by orientation and mobility specialists and classroom teachers and to develop a manual for teaching sound localization skills which would incorporate the use of a sound source such as the PAGL.

A questionnaire was distributed to 217 orientation and mobility specialists and classroom teachers regarding their use of the PAGL and the specific activities they had used for teaching sound localization skills. Limited information was obtained from the target population. Only 22% of the questionnaires were returned and of these only 28% had either seen the PAGL demonstrated or had used it.

A three day Sound Localization Institute was held at APH in April 1972 for the purpose of reviewing results of the questionnaire and developing a sound localization manual. The manual that was developed was a direct outcome of the institute and describes a variety of activities useful in teaching sound localization skills. A sequential development of localization skills were represented in the suggested activities.

In addition to the manual, the institute participants made several recommendations regarding refinement of the activities, dissemination of the manual, changing the name of the device, and adaptations which would contribute to its greater effectiveness as a sound source for the development of localization skills. This research was conducted by Roy Brothers and Roger Huff. Institute participants are listed at the end of this report.

#### Educational Materials Development Planned for Fiscal 1973

c. Development of instructional kit for braille code recognition materials

One objective of the IMRC is to promote the efficient use of educational materials having demonstrated utility in the education of visually handicapped students.

In an effort to realize more completely the total resources of the Special Education Instructional Materials Center (SEIMC) Network, the IMRC and the Michigan State University Instructional Materials Center (MUS/IMC) have initiated a joint effort to develop an instructional kit



which will prepare teachers to use the braille code recognition materials developed and validated by Umsted and Henderson. This project will be conducted by Roy Brothers and personnel from the MSU/IMC.

#### d. Study of the Chang mobility kit

Efforts to delineate appropriate activities and uses for selected educational aids will continue. During the coming year, suggested activities and expanded uses for the APH Chang mobility kit will be explored. Basic information will be obtained from those individuals who have used the aid extensively. Possible modifications will be considered, especially those that would add to its versatility within the classroom. Roy Brothers and Roger Huff will conduct the study.

### 7. Test adaptation

APH has traditionally provided braille and large type editions of the Stanford Achievement Test series and, along with it, a variety of other batteries of achievement and ability tests. The latest additions were made during 1964 and 1965 when Forms W and X of the Stanford Achievement Test, Form A of the School and College Ability Tests, and Form B of the Sequential Tests of Educational Progress were made available in both braille and large type. In order to provide braille editions of tests, extensive editing is required. This includes the deletion of tests that are highly pictorial in nature and the omission of items from other tests where they are not suitable for braille transliteration. Such items are usually those involving the use of drawings or complicated or three dimensional graphics. The main problem in APH's test adaptation is in providing norms for use with the braille editions. New norms have to be computed for all tests from which items have been omitted. These new norms must reflect only those items appearing in the braille edition and are, therefore, specific to it.

### Educational Materials Development Planned for Fiscal 1973

#### a. Stanford Achievement Test, Forms A and B

Harcourt Brace Jovanovich, Inc. is updating the Stanford Achievement Test series. The new forms (A, B, and C) are to be normed during the 1972-1973 school year. Arrangements will be made with the publisher to have norms computed for the braille editions from their original norming data. The norms for the ink-print editions will be appropriate for use with the large type editions.

During Fiscal 1973 the tests in Forms A and B of the new Stanford Achievement Test series will be edited for braille, braille and large type editions will be produced, and directions for administering both will be written. June Morris and Carson Nolan will be responsible for this project. They will be assisted by Marvin Murr.



## b Test development advisory group

A need has been recognized for professional help in the selection of tests to be produced by APH from among the multitude of tests on the market. In order to meet this need a group of individuals knowledgeable in the use of tests with visually handicapped students will be assembled during Fiscal 1973 to discuss needs in the area and to help identify specific educational measures, beyond those currently provided by APH, for which there is a need. A criterion for selection of these tests is that they be suitable for transliteration into braille. Once such tests are identified, priorities for their production will be established. Carson Nolan and June Morris will be responsible for the assembly of this advisory group and the writing of a strategy report resulting from its meeting. The report will be used as a guide for future test adaptations.

## D. Bibliographies

For some years bibliographies on research, testing, and other specific areas such as braille have been published by APH as a service to students, researchers, and other professional people working with or interested in the visually handicapped. Such bibliographies have been periodically updated. References for these bibliographies have accrued through systematic search and documentation of the literature of the field which has been an intrinsic part of the research process. After completion of review of the 1971 literature, it was decided to update four major bibliographies through 1971. Because there now exist abstracting services (Psychological Abstracts, Exceptional Child Education Abstracts, Dissertation Abstracts International, and Educational Research Information Center [ERIC]) which overlap to varying degrees with the Printing House's bibliographies, it is highly probable that these will represent the last editions of these bibliographies. June Morris and Carson Nolan share responsibility for these publications.

### Research Conducted during Fiscal 1972

#### 1. Bibliography on Tests and Testing of the Blind

This bibliography is a general bibliography which includes references to articles concerning theoretical or practical aspects of testing; historical development of testing; manuals, instructions, and methods of administration of tests; descriptions and evaluation of tests; the development and adaptation of tests for the blind; and uses of tests where reports are given of results obtained when established tests were used with blind populations. This bibliography contains 419 references.

### Research Planned for fiscal 1973

#### 2. Bibliography of Research on the Visually Handicapped

Only references to reports of research on the visually handicapped in which empirical data of some kind were collected will be included in this bibliography. Most of the studies will focus on legally blind

subjects. Medical research on the eye and blindness will be excluded. This bibliography will be supplementary to the general bibliography compiled by Helga Lende and published as Books about the Blind in 1953 by the American Foundation for the Blind. Approximately 1300 references will be included.

### 3. Bibliography of Research on Braille

The title of this bibliography is self-explanatory. It will include about 130 references.

### 4. Bibliography of Research on Large Type Reading

As with the previous listing, the name of the bibliography is its own description. As little research has been done on this topic, it will be a short bibliography containing only about 50 references.

### Agencies Collaborating in Research during the Year

Fiscal 1972 saw a large number of outside schools and agencies collaborating in our research and development efforts. These included the following residential schools for the blind: Alabama, California, Governor Morehead, Indiana, Kentucky, Maryland, Mississippi, Missouri, New York State, Ohio, Ontario, Overbrook, Perkins, Tennessee, Texas, and Utah.

Public school systems in the following states participated: California--Cupertino, Fairfield-Suisun, Fresno, Kern County, Long Beach, Rowland Heights, San Bernardino, San Juan Unified, Santa Monica, Temple City, Visalia, Yuba County; Florida--Dade County, Orange County, Pinellas County, West Palm Beach; Illinois--Chicago, Rockford; Kentucky--Louisville; Michigan--Battle Creek, Detroit, Flint, Grand Rapids, Jackson, Royal Oak, Saginaw, Warren Consolidated; New York--Board of Cooperative Educational Services--(Jerico, Suffolk County), New York City, West Seneca; Ohio--Canton, Cincinnati, Dayton, Mad River, Parma, Toledo, Willoughby-Eastlake; Pennsylvania--Allegheny County; Texas--Fort Worth, San Antonio; Washington--Tacoma; and Wisconsin--Green Bay.

### Publications

- Brothers, R. J. Aural study systems for the visually handicapped: Effects of message length: Interim progress report no. 8. Louisville, Ky.: American Printing House for the Blind, 1971. [Project No. 8-0046; Grant No. OEG-0-8-080046-2670(032)] [Also in Education of Visually Handicapped, 1971, 3, 65-70.]
- Brothers, R. J. Learning through listening: A review of the relevant factors. New Outlook for the Blind, 1971, 65, 224-231. [Also in New Beacon, 1971, 55, 310-315.]
- Brothers, R. J. Arithmetic computation by the blind: A look at current achievement. Education of the Visually Handicapped, 1972, 4, 1-8.
- Franks, F. L. Institute report on introducing basic science concepts to primary grade visually handicapped students. Louisville, Ky.: American Printing House for the Blind (Instructional Materials Reference Center), 1972.
- Franks, F. L. Institute report on map reading for primary grade visually handicapped students. Louisville, Ky.: American Printing House for the Blind (Instructional Materials Reference Center), 1972.
- Franks, F. L., & Baird, R. M. Geographical concepts and the visually handicapped. Exceptional Children, 1971, 38, 321-324.
- Kederis, C. J., & Nolan, C. Y. Braille codes pilot project: 1 December 1970--31 January 1972: Final report. Louisville, Ky.: American Printing House for the Blind, 1972. (Grant No. 14-P-55094/4-01)
- Leach, F. Multiply handicapped visually impaired children: Instructional materials needs. Exceptional Children, 1971, 38, 153-156.
- Leach, F. Commercially available instructional materials for use in the development of elementary readiness skills in young visually handicapped students. Louisville, Ky.: American Printing House for the Blind (Instructional Materials Reference Center), 1972.
- Morris, J. E. Aural study systems for the visually handicapped: Effects on aural learning of a prior frame of reference: Interim progress report No. 7. Louisville, Ky.: American Printing House for the Blind, 1971. [Project No. 8-0046; Grant No. OEG-0-8-080046-2670(032)]
- Morris, J. E., & Nolan, C. Y. Bibliography on tests and testing of the blind. Louisville, Ky.: American Printing House for the Blind, 1971.



Unpublished manuscripts

- Albano, L. G. Prominent geographical features appearing on continental maps. Unpublished manuscript, American Printing House for the Blind (Instructional Materials Reference Center), 1972.
- McCrimmon, S. Programmed instruction as a means of teaching blind children addition and subtraction on the abacus. Specialist in education thesis, George Peabody College for Teachers, 1972.
- Murr, M. J. Seed plant illustrations in biology textbooks. Unpublished manuscript, American Printing House for the Blind (Instructional Materials Reference Center), 1971.

Research and Development Personnel for Fiscal 1972

Albano, Liborio, MA - EMR&D Assistant (summer)

Berla', Edward, PhD - Behavioral Research Scientist

Biacchi, Anthony, EdM - EMR&D Assistant

Brothers, Roy, EdD - Behavioral Research Scientist

Caton, Hilda, Ed. Spec. - EMR&D Specialist (part-time)

Coy, Ken - EMR&D Technician

Franks, Frank, Ed. Spec. - Senior EMR&D Specialist

Huff, Roger, MS - EMR&D Associate

Kederis, Cleves, MA - EMR&D Specialist

Leach, Fay, EdD - EMR&D Specialist

McCrimmon, Suella, MA - EMR&D Intern

Morris, June, MS - Behavioral Research Scientist

Murr, Marvin, BA - EMR&D Assistant

Nolan, Carson, PhD - Coordinator, Educational Research, Development, and  
Reference Group

Pinson, Pamela - Secretary

Pohlman, Jeanne - EMR&D Assistant (summer)

Riley, Judy - Secretary

Yick, Margaret, MA - Visiting teacher on sabbatical leave (fall)

### Consultants during Fiscal 1972

#### Consultants in Primary Level Braille Reading

Miss Freda Henderson, Curriculum Director, Tennessee School for the Blind

Mrs. Estelle Hagood, Instructional Supervisor, Texas School for the Blind

Mrs. Ina Kurzhals, Acting Principal, Utah School for the Blind

Dr. Evelyn Rex, Assistant Professor, Illinois State University, Normal

Mrs. Sara Schell, Resource Teacher, Atlanta Public Schools

Mrs. Marian Anderson, Program for the Visually Handicapped, Savannah, Georgia

Miss Emma Rowe, Teacher, Dade County Public Schools, Miami, Florida

Miss Eleanor Pester, Resource Teacher, Griffith, Indiana

Mrs. Betty Wommack, Instructional Supervisor, Kentucky School for the Blind

Mrs. Jane Wegeholt, Primary Teacher, Illinois Braille and Sight-Saving School

#### Participants in the Social Studies Institute

Mr. John T. Bennett, Secondary Social Studies Teacher, Indiana School for  
Blind

Mr. Gary Coker, Principal, Tennessee School for the Blind

Mrs. Mary Nell Council, Elementary Social Studies Teacher, Tennessee School  
for the Blind

Mrs. Edith Georgi, Elementary Social Studies Teacher, Kentucky School  
for the Blind

Mrs. Ruth Holmes, Science-Social Studies Teacher, Illinois Braille and  
Sight Saving School

Dr. Arthur Lown, Project Director, Vision Center, Atlanta Public Schools,  
Georgia

Dr. Willard Smith, Department of Education, George Peabody College, Nashville,  
Tennessee



### Participants in the Science Institute

Mr. Norman Anderson, Elementary Science Teacher, Maryland School for the Blind

Miss Annette Bettinger, Elementary Teacher, New York State School for the Blind

Miss Betty Sue Hill, Director, Special Education, Owensboro Public Schools, Kentucky

Mrs. Marian Lewis, Elementary Science Teacher, Tennessee School for the Blind

Mr. Vernon Lustick, Secondary Science Teacher, Missouri School for the Blind

Mrs. Elise Nichols, Elementary Science Teacher, Tennessee School for the Blind

Mrs. Nellie Slaton, Coordinator, Science Program, Frances Blend Elementary School for Blind and Partially Sighted, Los Angeles, California

### Consultants in Sound Localization Skill Development Project

M. Bernadette Alber, Resource Teacher of Visually Handicapped, Evanston Township High School, Illinois

Ralph Brewer, Pre-school Counselor, Tennessee School for the Blind

Gary Coker, Principal, Tennessee School for the Blind

Will Evans, Dean of Students, Kentucky School for the Blind

Robert Gockman, Orientation and Mobility Instructor, Edward Hines, Jr. Hospital, Hines, Illinois

Ned Jackson, Orientation and Mobility Instructor, Illinois Braille and Sight Saving School

### Individual Consultants

Donald C. Wilson, Secondary Science Teacher, Oak Hill School (simple machines and the light probe)

Mrs. Marian Lewis, Elementary Science Teacher, Tennessee School for the Blind (evaluation of Xerox science materials)

Mrs. Elise Nichols, Elementary Science Teacher, Tennessee School for the Blind (evaluation of the Xerox science materials)

Mrs. Katie N. Sibert, formerly Itinerant Teacher, Stanislaus County California Schools (materials needs of low visioned)

Individual Consultants (continued)

Marcia Wilson, Primary Teacher, Morton Public Schools, Illinois (primary  
braille reading)

Janet Rader, Primary Teacher, East Peoria Public Schools, Illinois  
(primary braille reading)









# American Printing House for the Blind

INCORPORATED

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## Educational Research, Development, and Reference Group

### Report on Research and Development

#### Activities - Fiscal 1973

Steady progress characterized the research and development activities conducted at the American Printing House for the Blind (APH) during Fiscal 1973. Our program continued to be broad with projects in the areas of reading, listening, science, mathematics, social studies, specific teacher training, pre-mobility materials, early language development, sensory motor readiness, test adaptation, and basic tactile perception. It has been suggested that our program may be so broad that it prohibits significant timely progress in any one area. We are reconsidering it in this light to determine if efforts concentrated in fewer areas might result in more significant progress.

During the year just past, we have spent time in improvement of our evaluation processes and techniques. This should result in greater assurance of the ultimate usefulness of the products we develop.

As attested by the list of outside contributors found at the end of this report, we have continued to seek the assistance of teachers, administrators, and others throughout the United States in our research and development efforts. Not only do these people significantly contribute to needs assessment, but they also play a continuing role in formative evaluation as projects progress. Individually and in groups they have made substantial contributions.

#### Progress in Specific Research Activities

In the progress descriptions that follow, the project leader and assistants are identified at the end of each project. Before describing progress on individual projects, the significant contributions of Ken Coy, our educational materials development technician to many projects, should be acknowledged. Mr. Virgil Zickel and various personnel from our plant have participated widely in materials design. Mr. Glenn Scheurich and his staff in the Talking Book Department have been actively and constructively involved in all projects involving recordings. Miss Marjorie Hooper and her staff of the Editorial Department also have made major contributions.



## A. Aural Study Systems for the Visually Handicapped/Facilitating Listening as a Medium for Education of the Visually Impaired

During Fiscal 1973 support for the Printing House's research in the area of listening continued to come from the Department of Health, Education, and Welfare's Office of Education; however, the program under which it was funded switched from Aural Study Systems for the Visually Handicapped, which terminated, to Facilitating Listening as a Medium for Education of the Visually Impaired. Work on the following projects was conducted during the year.

### Research Conducted during Fiscal 1973

#### 1. System development and evaluation reports

Two reports were completed and published describing work previously done under the Aural Study Systems program. The first of these described the Aural Study System developed at the Printing House and the second reported on two field trials conducted to evaluate the system. June Morris and Carson Nolan were responsible for the reports. Roy Brothers participated in the evaluation.

#### 2. Guide to effective study through listening

The guide describing techniques for effective study using recorded materials has been completed. Coauthors were Carson Nolan, Roy Brothers and June Morris.

#### 3. Reference study

The purpose of this study was to explore the usefulness of the APH Aural Study System as a reference service. In order to do this, use of written and recorded versions of reference materials by legally blind students was compared. The reference works under study were selections from The World Book Encyclopedia and Thorndike-Barnhart Junior Dictionary. Subjects involved were 36 students from grades 4-12 representing both residential and public school systems. The students were first trained in how to use the Aural Study System to locate items in recorded versions of the reference works. Then they were required to locate similar items in written and recorded versions and answer specific questions relating to them. Comparisons were made in terms of the speed and accuracy of their responses. Subjectively, it was noted that the efficiency of use of either version was highly contingent on the user's skill in use of the rules for alphabetization. All subjects were able to operate the hardware of the system with no apparent difficulties. June Morris was responsible for this study. Anthony Biacchi and Marvin Murr assisted.

During the year, the project staff and other APH personnel collaborated with Field Enterprises Educational Corporation in exploring application of the Aural Study System concept in publication of a

recorded version of The World Book Encyclopedia. This included design of a production prototype record player with 30 index points of entry.

4. Exploration and development of index systems for open reel and cassette tape recordings

Code needs of blind tape users were analyzed. A number of possible tonal code formats were developed and a demonstration tape made. This tape was reviewed by project personnel and the four best codes were selected for experimental comparison. These were codes that vary in duration of signal, pitch of signal, pitch and duration of signal, and changing pitch and duration of signal. Numbers 0-9 can be represented with no more than 3 tones. An experimental plan was developed to compare the codes for ease of learning and retentive quality. Work was started on development of experimental materials.

Vocal code possibilities were also surveyed. The feasibility of voice indexing a dictionary using low frequency recording on the same track of the text was explored. Special recording equipment to offset frequency shifts of the signal accompanying change in capstan speed had to be designed. This design is almost complete.

This is a cooperative project with the University of Louisville. Carson Nolan and Emerson Foulke are the investigators.

#### Research Planned for Fiscal 1974

5. Field test of the production prototype of the APH Aural Study Systems record player

As described above, production prototypes of this player are being designed that allow 30 index points to be accessed through a small keyboard. Immediately, upon availability, these prototypes will be subjected to human engineering evaluation. The critical factor to be studied is the ease with which students in grades 5-12 can learn and operate the new indexing system. Carson Nolan and June Morris will conduct these tests.

6. Reference study

A report of last years' reference research will be completed by June Morris. Possibilities of recording additional reference works will be explored. Those under consideration include an adult dictionary (e.g., Webster's New World Dictionary of the American Language), a thesaurus, and possibly The World Almanac.

Initially, the format of the various works will be reviewed to determine if recording is feasible. Where feasible, appropriate editorial formats will be designed, subjected to expert review, and revised

where necessary. Where satisfactory formats cannot be developed for a reference work, its evaluation will be terminated. During Fiscal 1974 work will be initiated on this project with the most promising or timely of the reference works being researched. June Morris will be responsible for this project.

#### 7. Exploration and development of index systems for open reel and cassette tape recordings

Both tonal codes and vocal codes will continue to be explored this year. The four tonal codes identified in Fiscal 1973 will be compared for each of learning and retentive quality using both sighted and visually handicapped students. In addition, the usefulness of three vocal indexing systems will be explored. These will include (a) recording vocal index information on the same track as the text content, (b) use of four track systems to provide parallel index information, and (c) exploring usefulness of the Zimdex system. This is a cooperative project with the University of Louisville under direction of Carson Nolan.

### B. Basic Research in Tactual Perception

#### Research Conducted during Fiscal 1973

##### 1. The effects of tactual noise on locating point symbols and tracking on a tactual map.

The purpose of this investigation was to determine the effects of irrelevant background information on blind children's ability to locate point symbols on a tactual map and to follow a tactual track. Two tactual pseudomaps were constructed. Both maps had identical line and point symbols in precisely the same locations. However, textured areal symbols were added to one map to provide irrelevant background information. This map constituted the "noise" condition and the map without the texture constituted the "noise free" condition. Seventy braille readers in grades 4-12 were randomly assigned to one of the two map conditions. The subjects' task was to locate as many of 17 target point symbols as possible in eight minutes or less. An additional task was to follow a tactual track from a starting point to the end. Subjects' performance was measured by how many target symbols were located, the time required to cover the entire map, how much of the tactual track was covered, and how much time was required to follow the track. The subjects in the "noise free" condition located 20% more target symbols than the subjects in the "noise" condition. In addition, the subjects in the "noise" condition required 36% more time to cover the map than the subjects in the "noise free" condition.

For the tracking task there was no difference between the "noise" and "noise free" conditions in terms of the amount of track covered. However, the subjects in the "noise" condition took 41% longer to follow the track than the subjects in the "noise free" condition. It was apparent that irrelevant information as represented by background



texture had a very disruptive effect on the blind child's performance with tactual maps. This research was conducted by Edward P. Berla' and Marvin Murr.

## 2. Stimulus legibility and symbology

It was proposed in last year's annual report that a study be carried out on the nature and number of stimulus dimensions that would produce discriminable symbols. However, it became apparent that information was lacking on the exact values of a given dimension that were discriminable by touch. Consequently, the first of a possibly long series of studies was begun on the psychophysics of active touch. The first dimension chosen was line width and the purpose of this study was simply to determine how much wider a variable line had to be in order to be discriminable from a standard line width. Using a standard psychophysical procedure, 93 braille students were presented with five different line widths ranging from .04 inch to .12 inch in intervals of .02 inch. Each of these lines were paired with 12 other lines, 6 larger and 6 smaller than each standard. Each pair of lines was presented to the subject and he was required to pick the line which was wider. Quite unexpectedly, the results showed that as line width decreased a greater proportion of the standard line had to be added or subtracted from a comparison line of equal width before the two lines appeared different to 95% of the braille students. A report will be written during Fiscal Year 1974. This research was conducted by Edward Berla' and Marvin Murr.

## 3. Map scanning

The purpose of this investigation was to explore further earlier findings that searching a tactual display with a vertical search pattern was superior to searching the same display with a horizontal search pattern. The fact that the vertical search pattern was superior to a horizontal search pattern was surprising when one considers that the horizontal search pattern was very similar to the hand motions used in reading braille. In order to investigate this finding further a more sophisticated research design was used which employed pre- and posttests, experimental and control groups, and a more complex pseudomap. Two horizontal scanning techniques (left to right) and one vertical (up and down) scanning technique were taught to three separate groups of braille students in grades 4-12. Performance in terms of the number of target symbols located, errors of duplication, and task time for the three training groups was compared to a control group which received no training, but an equal amount of time in practice. One hundred and forty-four braille students participated in this research. The vertical search pattern was the only pattern which proved to be significantly better than the control group. Subjects in the horizontal search conditions performed poorly because of (a) a marked and intrac-table tendency on the part of the students to veer either up or down as their hands moved from left to right and right to left across the map,

(b) the limited field of view imposed by the fingertips when scanning horizontally, and, (c) a tendency in the horizontal pattern to skip parts of the map when the hands were repositioned after each horizontal band was searched. With the vertical search pattern there was little or no tendency to veer, a larger field of view when scanning, and substantially less skipping. The results of research for this year and last year suggest that teaching a vertical search pattern may be a good way of beginning to teach map reading skills. This research was conducted by Edward Berla' and Marvin Murr.

#### 4. Orientation and identification of tactual symbols

A study was proposed to investigate the effects of training braille students to identify shapes which differ in orientation. However, additional information obtained this year suggested that this line of research would be less fruitful than additional projects having to do with tactual maps. Consequently, this project was delayed.

#### Research Planned for Fiscal 1974

#### 5. Comparison of the map reading efficiency of trained and untrained readers operating under different frames of reference

Previous research found that students in map reading failed to use a quick preliminary scan of the display to gain a general frame of reference prior to a detailed examination of a map. A swift preliminary scan of a tactual display should provide the student with information about the size of the display, the nature of the symbology, where information is concentrated on the display, and about the relative location of some of the symbols on the display. Thus, if students were asked to locate specific symbols on the map, those students who gave the display a preliminary scan should be able to locate more of the target symbols and to locate these more quickly than those students who did not make a preliminary scan. This fiscal year a research project will be designed and conducted to test these assumptions by Edward Berla'.

#### 6. Comparison of the effects of different formats for representing bounded space on recognition of specific areas on political maps

Problems inherent in the design and legibility of maps have been delineated by earlier research. Factors which have been shown to affect map legibility are the amount of information on the display, complexity of the display, figure-ground quality of the display, figural redundancy, amount of irrelevant information, and texture. One specific problem the blind child faces is determining the shape of a bounded space within a larger complex of bounded areas and/or differentiating between two areas bounded by a common line. For example, on a typical paper map of the United States, all the states are bounded by a single kind of line. The child's task is to attempt to delineate a specific shape from a mass of

intersecting lines. The problem is a tactual analogue of an embedded figures test. Consequently, maps should be designed for maximum ease of delineation of figures from ground and for differentiating between adjacent bounded areas. This problem may be ameliorated to some extent by using different formats for representing bounded space. Specifically, a bounded space can be represented by only one line or each bounded area can be represented by two lines; one line that gives the shape of the state and a different line to separate the state from surrounding states. In addition, different textures can be used within the boundaries of a state to differentiate it from adjacent areas. Development will proceed this year to determine additional formats for representing bounded space, to examine the feasibility of producing maps in these different formats, and then testing the different formats to determine which contributes to the legibility of the map. This project will be conducted by Edward P. Berla' assisted by Marvin Murr.

## 7. Tactual symbology

Research will continue during Fiscal 1974 to determine the discriminability of tactual symbols by braille readers. This study will be an extension of the line width study conducted during Fiscal 1973. Lines of greater width than those used in the previous study will be used in order to determine the 95% discriminability threshold. An additional study on a different tactual dimension may be conducted also depending on the outcome of the proposed study. This research will be conducted by Edward Berla' and Marvin Murr.

## C. Braille Codes Refinement and Expansion

The purpose of this project was to refine and expand the braille codes for textbook formats and techniques, mathematics and science, music, and computer notation. This effort was a sequel to the Braille Codes Pilot Project reported in Fiscal 1972. To date attempts to raise funds for this project have been unsuccessful. Consequently, its future is not clear at this time.

## D. Educational Materials Research and Development Supported through the Instructional Materials Reference Center (IMRC)

For several years, a grant from U. S. Office of Education has supported a variety of educational materials development activities as well as educational materials reference services. The following projects received support from this source.



## 1. Science program

### Educational Materials Development during Fiscal 1973

#### a. Introductory simple machines

A commercially produced lever was modified for use by young blind students. The modified lever was pilot tested (a) to determine if the adaptations were appropriate and (b) to develop a format for testing additional simple machines.

Legally blind second and third grade students participated in the pilot test. Performance scores indicated that boys performed no better than girls and that second graders achieved on the same level as third graders.

Results of pilot testing indicated that the format could be used for testing all simple machines including the pulleys, inclined plane, and wheel and axle. Frank Franks conducted this test.

#### b. The light probe

More than 30 simple experiments using the light probe have been performed by blind students in science classes in several schools for the blind. These experiments have been compiled and edited. They will be made available to the field as soon as an APH light probe is produced. Frank Franks was responsible for this work.

#### c. Pull-apart cell

Final evaluation of the pull-apart cell has been completed. Results confirm that young blind students in the primary grades can perform discrimination and manipulation tasks necessary for using the pull-apart cell. Frank Franks and Roger Huff completed this task.

#### d. Dial thermometer instructional unit

The dial thermometer instructional unit has been evaluated. Results confirm that young blind students in the primary grades can perform discrimination and manipulation tasks necessary for using the dial thermometer aid. This evaluation was conducted by Frank Franks and Roger Huff.

### Educational Materials Development Planned for Fiscal 1974

#### e. Introductory simple machines

Final adaptations to the pulley, the wheel and axle, and the inclined plane will be made. Materials for evaluating these machines will be completed and field testing will be conducted during Fiscal 1974. Frank Franks is the task leader.

## 2. Mathematics program

### Educational Materials Development during Fiscal 1973

Two materials development projects in primary mathematics (tactile ruler and geometric forms) neared completion. Upon completion of these two projects, materials development in primary mathematics will be temporarily suspended. A thorough review of additional mathematics materials development research including problem selection and needs identification will be conducted to determine the scope of future research. Roger Huff was responsible for this work.

### Educational Materials Development during Fiscal 1974

#### a. Tactile ruler

These materials to introduce the ruler to primary students, have been redesigned. An evaluation proposal has been completed and is currently being critiqued by an in-house mathematics research committee. Data collection procedures constituting the final evaluation of these materials are being specified. Larry Butterfield will complete this research.

#### b. Geometric forms

These materials are designed to teach the concepts of open and closed curves and plane and solid forms to primary students. The in-house mathematics research committee has reviewed the final evaluation proposal for this project. Data collection has been scheduled. Larry Butterfield will undertake the completion of this project.

## 3. Social Studies

### Educational Materials Development during Fiscal 1973

#### a. Introductory map reading materials

The purpose of this study was to develop an instructional program and an accompanying set of maps for teaching the use of locational and directional referents on maps to young blind students. The instructional program sequentially presented locational and directional referents within an environmental frame of reference which allowed for interrelating these fundamental map reading concepts with the classroom, with the school environment, and with natural and cultural geographical features within the community.

Eighty legally blind students from three residential schools for the blind were used to evaluate the effectiveness of the instructional program and accompanying maps. These subjects were classified by mode of reading (braille or print) as indicated in school records. Subjects were

matched on pretest scores and then distributed by age to form equivalent experimental and control groups. The subjects in one school formed the experimental group which was matched with subjects from the two remaining schools to form a matched control group

A four-way analysis of variance was performed on pretest and posttest scores for all of the groups included in the study. Subject groups (experimental vs. control), mode of reading (braille vs. print), and chronological age (older vs. younger) were treated as between-subjects variables; and test scores (pretest vs. posttest) were treated as a within-subjects variable.

The main effect of the experimental group versus the control group revealed that the instructional program presented an effective approach for teaching locational and directional concepts to the young blind students in this study. The overall performance of the experimental group of students was significantly greater than the overall performance of the control group. No significant difference in performance occurred between braille and print groups. The older group achieved a higher overall level of performance than did the younger group although both groups made significant gains. Gains in learning were significantly higher for the experimental group. Significant gains in learning were reported for 26 of the 30 concepts taught in this program. Prior knowledge is attributed to the low increase in learning on the four remaining concepts. Frank Franks, Roger Huff, and Marvin Murr completed this work.

#### b. Simplified continental relief maps

A simplified continental relief map of North America was developed and pilot tested (a) to determine the discriminability of the prominent geographical features on the map, (b) to develop a format for testing additional simplified continental relief maps, and (c) to obtain feedback for developing additional maps.

Fifty-four legally blind students in grades three through six from three residential schools for the blind were used to test the legibility of nine prominent geographical features on the map. A criterion of 80% correct responses for identification of each feature was met by eight of the features. One feature--the Mississippi River--represented by the incised groove failed to meet the criterion. However, all students were able to recognize the groove once its location was shown.

Subsequent maps will be developed similarly with consideration for greater exaggeration, repression, and incision of symbols to increase map legibility of geographical features represented. The testing format was found suitable for testing the maps and will be used in testing all maps in this series.



Inspection of performance scores for younger versus older students indicated that the groups of students achieved similar performance scores on the test. Frank Franks was responsible for this project.

#### Educational Materials Development Planned for Fiscal 1974

##### c. Maps in the classroom and school environment

This project is designed to develop educational materials for teaching young blind students that real objects in a known environment (classroom) can be represented abstractly.

The project materials will present the following concepts as they relate to abstract representation of real objects in the environment:

- 1) Orientation to the classroom. Students locate and describe objects in the classroom using locational and directional referents.
- 2) Mobility in the classroom. Students use locational and directional referents to move in the classroom.
- 3) Use of symbols on maps. Students recognize small toys as scale models of the real objects and geographic features, students use blocks and other small objects as "symbols" for real objects, and finally, students use symbols in making and interpreting simple maps in the classroom.

The development of a map reading program with appropriate educational materials will enable teachers to introduce map reading concepts to young visually handicapped students at the same time and grade levels as their sighted peers received the instruction. At present visually handicapped students at the primary grade level received little or no instruction in map reading because appropriate materials for this instruction do not exist. The availability of these materials through APH should stimulate the early introduction of map reading to visually handicapped students in residential and public school programs throughout the country. Implications are for improved map reading instruction in educational programs for these students, nationally, and for the development of more tactually discriminable maps at APH in future years. Frank Franks will direct this work.

##### d. Simplified continental relief maps

This project is designed to develop simplified continental relief maps for use by young visually handicapped students. Prominent geographical features provide reference points for understanding and learning the use of locational and directional referents on maps.

This project is a continuation of the project described previously under the same heading. The development schedule for the overall project is for the development and field testing of relief maps of South America and Europe in Fiscal 1974 and development and field testing of maps of Asia, Africa, and Australia in Fiscal 1975. This task is the responsibility of Frank Franks.

e. Lesson guides for geographical readiness concepts

The purpose of the lesson guides for geographical readiness concepts will be to provide experiential readiness activities in geography for visually handicapped children. The lesson guides will be designed to give students opportunities to interact directly and concretely with geographical features in their own environment and to gain knowledge of configuration, physical characteristics, size, and relationship with other geographical features. Emphasis will be on the development of oral language skills, gross tactual and manipulative skills, and the development of the ability to think critically--as related to the learning of geographical concepts. The lessons will also give students experiences which will lead to the development of skills in map and globe reading.

Geographical concepts to be included in the lesson guides will be identified during September 1973, specifications for lesson content and format will be written, and a first draft of the lessons will be written. The materials will be reviewed in January 1974 and then will be revised. A field evaluation will be conducted during the spring of 1974. Following the field evaluation, decisions will be made regarding the need for further evaluation and/or production. The project director is Hilda Caton.

4. Materials for the multihandicapped visually impaired

a. Elementary auditory and oral language skills

Educational Materials Development during Fiscal 1973

1. Adaptation of the "Listen and Think" materials

Levels B and D of Educational Developmental Laboratories "Listen and Think" taped lessons were adapted, field tested, and submitted for production. These materials were designed to provide taped lessons for the development of listening and thinking skills. The adapted lessons incorporate the ink-print workbook activities into the recorded tape and utilize a simple answer sheet format for student response. The materials are designed with the student's independent functioning as a key goal. Fay Leach was assisted by Anthony Biacchi in this adaptation.

2. Questionnaire on audiolinguistic skills development

Seventeen persons were identified by the trustees and administrators at the annual APH meeting in 1972, as persons involved in early audiolinguistic skills development of visually handicapped students. Twelve (71%) responded to a questionnaire posing six questions concerning problems, needs, resources, and available materials.

Examination of the list of problems of young visually handicapped children indicates a major deficit in appropriate auditory training materials. Preparation to teach audiolinguistic skills is most hindered by a lack of interest-capturing and sequential materials. More research on the skills development of very young visually handicapped children is needed. Materials requested are those which utilize a multisensory approach. Repeated requests were made for more records and tapes. A compilation of the responses was submitted to the audiolinguistics skills development project committee for review during a workshop held January 1973. Fay Leach conducted this survey.

### 3. Workshop on early audiolinguistic development

This workshop was held January 24-26, 1973. A team of five project consultants specified 14 project guidelines and 10 priority educational materials needs. The committee stressed:

- (1) That there are increasing numbers of visually handicapped children with a variety of degrees of language disabilities and auditory problems. Many of these require more recorded materials.
- (2) The need for early intervention (functional age six and under) is especially critical in audiolinguistic skills development.
- (3) That there is a major deficit in curricular materials and annotated information on available materials which might assist teachers, parents, and/or parent substitutes in knowing how to stimulate audiolinguistic skills. Any new materials developed should be accompanied by appropriate curricular aids.
- (4) Because of pressing need for materials, and the time required for the development of new materials, focus in this project should be on the adaptation of presently available materials.
- (5) There must be significant differences in structuring for the stimulation of audiolinguistic skills development for the visually handicapped child. A multisensory approach is especially important.

Details of the workshop are available in the workshop report. Fay Leach organized this workshop and was assisted by Anthony Biacchi.



## Educational Materials Development Planned for Fiscal 1974

### 4. 'Adaptation of "Listen and Think" (E & G)

Two additional units of Educational Development Laboratories "Listen and Think" taped lessons will be adapted by Fay Leach and John Cardinale.

### 5. Survey of major preschool language development programs

The audiolinguistics workshop mentioned earlier recommended adaptation of currently available programs for use with the visually handicapped over attempts to develop original materials. Consequently, a survey of major preschool language development programs will be conducted. This survey will evaluate their adaptability for use with visually handicapped children and their capacity to meet specific problems of audiolinguistic functioning. Fay Leach and John Cardinale will make this survey.

### 6. Development of experience-relevant stories

The audiolinguistics workshop commented on the inappropriateness of many available recorded materials for use with visually handicapped children in grade three or lower. They suggested that stories relevant to the experiential and conceptual levels of these children be especially written and recorded. The feasibility of this will be explored through use of experts and other means. Hilda Caton, John Cardinale, and Fay Leach will be responsible for this work.

### 7. Rules for talking to visually handicapped children

A slide-cassette program providing guidelines for parents and teachers on how to talk to very young hearing impaired children so as to optimize the development of receptive language and stimulate expressive language has been developed at the Bill Wilkerson Hearing and Speech Center. The feasibility of providing similar materials for visually handicapped children will be explored by Fay Leach and John Cardinale.

### b. Sensory-motor readiness materials

## Educational Materials Development during Fiscal 1973

### 1. First Peg Kit

The First Peg Kit consists of three 1 7/8 inches and six 1 inch pegs with a box and six sorting frames. Primary colors are used (red, yellow, blue). Each peg has one, two, or three grooves. The Kit is designed for simple manipulation and discrimination tasks. Eight copies of the prototype were placed in kindergarten-first grade programs for field testing. The evaluation was positive and the Kit was submitted to the production department for a production model which would incorporate

suggestions for improvement. A guide for use cannot be completed until after a final model is approved. Fay Leach conducted this evaluation.

## 2. Sensory Cylinders

The Sensory Cylinder Set is composed of six fiber cylinders designed to compare three pairs of weights (300, 200, and 100 grams) and six textures. Secondary colors (purple, orange, and green) occur in the fabric textures; the styrene textures are white. The cylinder set has been so designed that no two matches of color, texture, or weight can be made simultaneously. The cylinders were evaluated using 65 legally blind students enrolled in the Governor Morehead School, Western Pennsylvania School for Blind Children, and Logan Elementary School (Philadelphia, Pennsylvania). Subjects had an age range of 5 years, 1 month to 8 years, 5 months. A follow-up test was made with 10 students (age 5 years, 2 months to 5 years, 11 months) at the Southern Baptist Seminary Day Care Center (Louisville, Kentucky). Children could make the discriminations involved, subsequently, the cylinder set was submitted for production model design. A guide for use cannot be completed until after a final model is approved. Fay Leach was assisted by Anthony Biacchi in this evaluation.

## 3. Audio-Cards

Two sets of audio-cards were developed for experimental purposes. Several companies were consulted concerning technical aspects. Present production methods are not readily convertible for production of a thermoformed card which can be produced on quantity basis. The technical production cost projections make the continuation of this project, at present, inadvisable. If the technical problems are resolved, a study of content priorities is recommended. Fay Leach conducted this feasibility investigation.

## 4. Monitoring of commercially available elementary sensory-motor readiness materials

This was continued during 1973; however, a revised materials listing has not been compiled as previously proposed for the 1973-1974 Fiscal Year.

## 5. Primary braille reading materials

### Educational Materials Development during Fiscal 1973

#### a. Developmental reading readiness program--A Tactual Road to Reading

During the last three years, research personnel have worked with Ina Kurzhals and a group of consultants to formalize the developmental readiness program, A Tactual Road to Reading, which she developed at the

Utah School for the Blind The program consists of a teacher's guidebook, which explains the origin, philosophy, and methods for implementing the program; 66 sample lesson plans in pamphlet form to guide teachers in using the materials effectively; and a set of 35 small tactual readiness books to be used by students. The lesson plans are organized into four categories: (a) Learning through the Environment, (b) Learning through Hand Skills, (c) Learning through Spoken Language, and (d) Learning through Books. The lesson plans in the section entitled Learning through Books explain the purpose and use of the tactual readiness books.

During Fiscal 1973, the materials were placed in the field with 13 teachers of visually handicapped children in both public and residential school programs. These teachers reviewed and evaluated the entire set of materials in actual use with students. The materials were used with 69 students in grades K-7 with chronological ages 2 1/2 years-11 years. Results of the evaluation indicated that the materials were effective at the pre-reading level and that some students who had not responded to other methods of learning to read braille responded to this method and made definite progress. The review was completed in May 1973, necessary revisions were made, and the materials are now being prepared for production. Anticipated production date is Fall, 1973. Hilda Caton is project director.

#### b. Development of Tactile Aids to Reading

The Tactile Aids to Reading are intended to:

1. Provide materials which will stimulate interest and curiosity about real things in the environment and, thus, an understanding of certain concepts encountered in reading
2. Provide materials which will develop an awareness of the importance of tactual discrimination skills
3. Provide a variety of interesting and motivational activities for teaching specific reading skills (i.e., phonics).
4. Provide materials which will supplement and/or replace illustrative materials in ink-print textbooks.

Based on an analysis of four basal reading textbook series, the aids will consist of a collection of 175 objects and the "Guidelines for Teachers". The guidelines will contain general suggestions for using the objects, two adapted lessons from basal readers, and appendices which contain suggested activities for classification, association, rhyming, and syllabication.



The collection of objects and the "Guidelines for Teachers" were reviewed by members of the Primary Braille Reading Consulting Group and by 11 teachers of visually handicapped children in both public and residential school programs. The materials were used with 43 visually handicapped children with chronological ages of ages 6 years to 15 years in grades K-7. Other handicapping conditions, in addition to visual, were noted for 7 of the students. The collection of objects was reviewed in terms of their suitability for use in beginning reading and in terms of their acceptability on the basis of their tactual attributes. Objects which were not considered to be acceptable by at least 70% of the reviewers were eliminated from the collection or replaced by better representations of the same item. The "Guidelines for Teachers" pamphlet was reviewed in terms of its usefulness in helping teachers use objects to present reading skills to visually handicapped children and in terms of its applicability to more than one reading series. Results of the review indicated that teachers found the pamphlet to be helpful in providing suggestions for using the objects. The reviewers also indicated that they considered the guidelines to be appropriate for use with any basal reading series currently in use. Hilda Caton developed these materials.

#### c. Development of tactual discrimination worksheets

The tactual discrimination worksheets are designed to provide visually handicapped children with experience and training in the discrimination of embossed geometric forms, raised lines in broken dot patterns, angular figures in broken dot patterns, and braille code characters. Orders of presentation of braille code characters are based on earlier legibility studies. The tasks involved in all four sets of worksheets will be purely discriminatory in nature. At no time will students be required to name geometric forms, kinds of lines or angular figures, or braille code characters.

During Fiscal 1973, specifications for the worksheets were written and sample sets were made for review. These materials were reviewed by an in-house committee composed of staff members of the Educational Research, Development, and Reference Group. Revisions based on the recommendations of this committee were made and the materials were then reviewed by members of the Primary Braille Reading Consulting Group. Additional revisions recommended by this group were made and sample sets were prepared for pilot testing. Work on this project was done by Hilda Caton and Tony Biacchi.

#### Educational Materials Development Planned for Fiscal 1974

#### d. Development of tactual discrimination worksheets

A pilot test of the tactual discrimination worksheets will be conducted in September 1973 to evaluate the effectiveness of the design of the worksheets and to evaluate students ability to use and

mark the worksheets correctly. Following the pilot test, necessary revisions will be made. A field evaluation will be conducted during the spring of 1974. Results of the evaluation will be analysed and decisions will be made regarding further evaluation and/or preparation for production. Hilda Caton is project director and will be assisted by John Cardinale.

e. Pre-primer braille reading materials

A set of primary braille reading materials developed by Mrs. Jane Wegehoft at the Illinois Braille and Sight Saving School was presented to the participants of the 1972 Primary Braille Reading Institute. The materials consisted of two sets of booklets to be used by students and instructions for teachers. The participants recommended strongly that the materials be considered for production by APH. Since that time, Mrs. Wegehoft has revised and reorganized the materials and their accompanying instructions for teachers. They now consist of two sets of drill-type booklets which are to be used alternately by students. The activities are designed to prepare children to read braille and provide drills which are motivational as well as effective for this purpose. The materials will be placed with members of the Primary Braille Reading Consulting Group for review in September 1973. Following this review, decisions will be made regarding revisions, further review, and production. Hilda Caton is project director and will be assisted by Jane Wegehoft.

6. Other IMRC educational materials research and development

Educational Materials Development during Fiscal 1973

a. Instructional kit for braille code recognition materials

The project represented an effort by three agencies of the Special Education Instructional Materials Network. The materials were a development of the APH/IMRC. Specific instructions and simulated activities were developed by the Michigan State University Instructional Materials Center and arrangements for the workshop experience and use of the materials in the classroom was coordinated by the Illinois Instructional Materials Center.

The general purpose of the project was to develop an instructional kit which would prepare teachers to use the Braille Code Recognition (BCR) materials. Subsequent evaluations were to determine the effectiveness of the teacher instructions and the effect of materials use on the braille reading skills of visually handicapped students. Use of the materials with students and their effect on braille reading skills are reported.

A total of 17 teachers were provided with a brief inservice experience in the use of the materials and subsequently 24 braille

readers used the materials. The use of the materials was generalized to a highly diverse sample of students. Students represented grades 4-12; braille reading experience ranged from 6 months to 11 years; and different degrees of academic functioning were noted.

Two basic indicators of student improvement were: increased accuracy in recognizing braille contractions, word signs, and short form words; and increased speed in recognizing the braille symbols. The ultimate criterion was increased wpm reading rate without loss of comprehension. During the 3 week trial period the mean number of recognition errors significantly decreased by approximately 82%. The mean recognition time for reading the BCR lists decreased by 47% which also was a significant reduction. The mean wpm rate on the pre-experiment test of silent reading was 64.38 wpm. The mean post-experiment rate was 73.58 wpm. A comparison of the means indicated a significant increase in braille reading speed for the group. No loss of comprehension was noted. The research was conducted by Roy Brothers.

#### b. Study of the Chang Mobility Kit

The purposes of the study were: (a) to substantiate mobility uses of the Chang Mobility Kit (CMK), (b) to list specific educational activities and/or teaching strategies which would be enhanced through use of the CMK, and (c) to assess the effectiveness of a revised CMK and instructional guide of educational activities.

Questionnaires were sent to a total of 76 schools and/or school districts which had purchased one or more Chang kits. Of this number 43% were completed and returned. The results indicated the kit was used predominately by O&M specialists. It was used most often with students at the junior high and high school level although 30% reported its use with primary age groups. It was generally used with individual students, but some group instruction was successfully carried out. It was also noted that the materials were most often used in the classroom, rather than serving as a portable map on the street. Modifications for the kit were suggested regarding size of pieces (i.e., smaller), number of pieces (i.e., more), and variety of shape (i.e., additional strips and rectangles).

The CMK was used to teach basic spatial concepts by 61% of the instructors. In addition to basic concepts, it was used to represent specific travel situations found in the students' travel environment. Eighty-five percent of the respondents thought the CMK was a versatile aid and 80% felt a series of lesson plans for use with the kit would increase its appeal as an educational aid.



Once the usefulness of the CMK was substantiated through the questionnaire, an institute was planned to review results of the questionnaire and to develop a series of specific educational activities and/or teaching strategies which could be used in conjunction with the CMK. The material was renamed the Chang Tactual Diagram Kit which more adequately reflected its expanded function.

As a result of the institute a preliminary draft of an Instructional Guide for the Chang Tactual Diagram Kit was developed. The 18 lessons developed in Part I included suggestions for meeting educational objectives in several curricular areas. The 19 lessons outlined in Part II reinforced relevant O&M practices and were directly related to prerequisite O&M concepts.

This research was conducted by Roy Brothers and Roger Huff.

#### Educational Materials Development Planned for Fiscal 1974

##### c. Review of Instructional Guide for the Chang Tactual Diagram Kit

The project represents a continuation of the Chang Mobility Kit study initiated during Fiscal 1973. The purpose of the study is to assess the effectiveness of the guide and tactual diagram materials. The materials and lessons are currently undergoing a field trial with visually handicapped students. Roy Brothers is responsible for the completion of this project.

#### Educational Materials Development Planned for Fiscal 1974

##### d. Abacus instruction

The purpose of the current project is to develop an instructional module for training teachers in the use of the Cranmer Abacus. The instructional module will contain a series of 15 programmed abacus lessons. The media for the lesson presentation will be instructional audio cassettes and a workbook. The workbook will integrate problem examples and manipulative exercises with the taped narrative. Each lesson will contain a short self-testing exercise to insure adequate proficiency for subsequent lessons. A final test of computational proficiency will also be included. The study will be under the direction of Roy Brothers.

#### 7. Educational measurement

##### Educational Materials Development during Fiscal 1973

##### a. Stanford Achievement Test, Forms A and B

A new series, Forms A and B, of the Stanford Achievement Test is being made ready for use during the 1973-1974 school year by its

publisher, Harcourt Brace Jovanovich. During Fiscal 1973 the Research Group at the Printing House worked closely with this company so that braille and large type editions also might be available during the 1973-1974 school year. Five of the six batteries of Forms A and B of the series are being adapted for use with the visually handicapped. These will provide for measurement of educational achievement from the middle of the second grade through the middle of the ninth grade.

During Fiscal 1973 the tests were reviewed and problem areas identified. The problems were then discussed and resolved with the help of a test advisory group (see section c). Next, decisions were made regarding items not appropriate for braille transliteration and arrangements were made to have special norms computed for all braille tests from which it was necessary to drop items. The next step was to edit the tests; these included 100 individual tests for the braille edition and 104 individual tests for the large type edition. This step included not only the editing of the tests, but also the adaptation of the instructions for each test to reflect braille and large type format and administration methods.

The last two steps in the preparation of the Stanford Achievement series were initiated during Fiscal 1973. These steps relate to writing the manuals needed for administration of these tests. Ten will be required; one for each battery of the tests for both the braille and large type editions. These steps include (a) rewriting the specific directions for administering each of the 204 individual tests and (b) preparing the supporting materials; such as, general instructions for braille and large type test administration, timing information, scoring information, keys, norms, and statistical data relating to the special norms prepared for some of the braille tests.

June Morris has been responsible for this project. Carson Nolan and Marvin Murr also have participated in it.

#### b. Test of Academic Skills (TASK), Forms A and B

TASK is published by Harcourt Brace Jovanovich as an upward extension of the Stanford Achievement Test. It is for use from the middle of the ninth grade through the middle of the thirteenth grade. For each form of the test, two batteries are included (Level I and Level II).

During Fiscal 1973 preparation of braille and large type editions of these tests has paralleled preparation of the Stanford Achievement series. The TASK batteries include 12 individual tests which have been edited for both braille and large type. Additionally, work on two manuals to accompany the tests (one for the braille edition and one for the large type edition) was initiated.

June Morris has been responsible for this project. Carson Nolan and Marvin Murr have assisted her.

c. Test advisory group

During March 1973, a group of eight persons with knowledge and/or interest in testing of the visually handicapped met at the Printing House to consider needs for further test adaptations and to make concrete suggestions regarding any such needs. The group agreed that there was a need for continuing efforts to provide current educational measures for use with the visually handicapped. Special needs were identified and priorities determined within these areas. Tests of general achievement and special achievement, most particularly reading and mathematics, were recommended as needing immediate attention. Additionally, the group suggested several specific tests for consideration. Subsequently, these tests have been obtained for review.

Carson Nolan was responsible for the assembly of this group. June Morris assisted him with it,

Research Planned for Fiscal 1974

d. Stanford Achievement Test, Forms A and B

The 10 manuals required for the administration of the tests in this series will be completed. June Morris is responsible for the writing of these.

e. Test of Academic Skills (TASK), Forms A and B

The two manuals required for the administration of the tests in this series will be completed and published after being approved by their ink-print publisher. June Morris bears the responsibility for this task.

f. Additional tests

The major continuing objective of this project is to adapt educational measures designed for normal students for use with the visually handicapped. During the initial months of Fiscal 1974 a survey of general achievement tests and of reading and mathematics diagnostic tests will be made to identify tests appropriate for adaptation. Selection of these tests will be guided by the following criteria: (a) That the tests fall within the need areas identified by the advisory group. (b) That the tests fall within the priority areas identified by the advisory group. (c) That the tests present no insurmountable obstacles to adaptation. (d) That the ink-print test publishers will give permission for adaptation. And (e) that the original standardization data are available in such form to enable them to be applied where necessary.



During Fiscal 1974 several needed tests will be identified and adapted for use by the visually handicapped. June Morris is responsible for this task.

## E. Bibliographies

As an auxiliary service to the research and development activities of the Educational Research, Development, and Reference Group, bibliographies relating to various aspects of the visually handicapped have been published and periodically updated since the mid 1950s. References for these have accrued over the years from systematic search of the literature. During Fiscal 1972 and 1973 four of these bibliographies were updated through 1971 and published for what will be the last time. The reason this service is being phased out is that there are now a number of abstracting services which overlap to varying degrees with the Printing House's bibliographies. June Morris and Carson Nolan have had the continuing responsibility for the compilation and publishing of these bibliographies.

### Bibliographies Published during Fiscal 1973

#### 1. Bibliography of Research on the Visually Handicapped, 1953--1971

This bibliography contains approximately 1,300 references to articles reporting studies conducted on or directly relating to (such as attitudes toward) legally blind subjects in which empirical data are reported. This bibliography, when used in conjunction with Helga Lende's Books about the Blind (published in 1953 by the American Foundation for the Blind), provides a complete listing of research on the blind through 1971.

#### 2. Bibliography of Research on Braille

The 132 braille studies cited in this bibliography represent all known research on braille for which data are reported.

#### 3. Bibliography of Research on Large Type Reading

The 51 articles cited represent a comprehensive listing of research on large type reading.

### Agencies Collaborating in Research during the Year

During Fiscal 1973 we continued to receive excellent cooperation and collaboration from schools and agencies throughout the nation. Residential schools for the blind participating included Alabama, Arkansas, Florida, Georgia, Governor Morehead, Indiana, Kentucky, Maryland, Michigan, Missouri, Ohio, Ontario, Overbrook, Tennessee, West Virginia, and Western Pennsylvania.

Public school systems in the following states participated: Illinois--Chicago, Decatur, Evanston, Gurnee, Palatine, Pekin, and Prospect Heights; Ohio--Cincinnati; and Pennsylvania--Philadelphia.

Other institutions participating included the Visually Handicapped Institute, Chicago; Southern Baptist Theological Seminary Day Care Center, Louisville; Child Study Center, Oklahoma University Medical School; Boston Center for Blind Children; Upsal Day School for Blind Children, Philadelphia; Georgia Center for the Multi-Handicapped, Atlanta; Illinois Instructional Materials Center, Springfield; and Instructional Materials Center, Michigan State University.

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Research and Development Personnel for Fiscal 1973

Berla', Edward, PhD - Behavioral Research Scientist

Biacchi, Anthony, EdM - EMR&D Assistant

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Caton, Hilda, Ed. Spec. - EMR&D Specialist

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Morris, June, MA - Behavioral Research Scientist

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Nolan, Carson, PhD - Coordinator; Educational Research, Development, and  
Reference Group

Pinson, Pamela - Secretary

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- Dr. Donald E. Bierman, Chairman, Geography Department, University of Louisville, Louisville, Kentucky
- Mr. Gary Coker, Principal, Tennessee School for the Blind, and Orientation/Mobility Specialist, George Peabody College, Nashville, Tennessee
- Mrs. Mary Nell Council, Elementary Social Studies Teacher, Tennessee School for the Blind, Nashville, Tennessee
- Mrs. Edith Georgi, Elementary Social Studies Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Miss Donna Passmore, Elementary Social Studies Teacher, Tennessee School for the Blind, Nashville, Tennessee
- Dr. Dennis Spetz, Associate Professor, Geography Department, University of Louisville, Louisville, Kentucky
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#### Consultants in Science

- Mr. Ross Huckins, Science Teacher, California School for the Blind, Berkeley, California
- Mrs. Marian Lewis, Elementary Science Teacher, Tennessee School for the Blind, Nashville, Tennessee
- Mrs. Elise Nichols, Elementary Science Teacher, Tennessee School for the Blind, Nashville, Tennessee
- Mrs. LaRhea Sanford, Elementary Science Teacher, Florida School for the Deaf and the Blind, St. Augustine, Florida
- Mr. Norman Anderson, Elementary Science Teacher, Maryland School for the Blind, Baltimore, Maryland

#### Consultants in Mathematics and Physical Science

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- Mr. Don Wilson, Oak Hill School, Hartford, Connecticut

Consultants for Study of Chang Mobility Kit

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Mr. Robert Chin, Mobility Specialist, Redwood City, California

Mrs. Irene Hawkinson, Itinerant Teacher, Sunnyvale, California

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Mr. Ross Huckins, Science Teacher, California School for the Blind,  
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# American Printing House for the Blind

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## Educational Research, Development, and Reference Group

### Report on Research and Development

#### Activities - Fiscal 1974

Fiscal 1974 saw continuation of the steady progress reported in last year's summary. Areas of concern during the year included reading, listening, science, social studies, specific teacher training, early auditory and oral language development, test adaptation, typing, and basic tactile perception. We were fortunate to continue to obtain adequate outside financial support for most of our research and development activities.

Many persons outside our group have contributed to our work this year. Consulting groups and individuals were, as previously, drawn from throughout the United States. A list of these is appended to this report. For the first time we have been assisted through subcontracts with higher institutions of learning. Included among these are George Peabody College for Teachers (Nashville) and the Universities of Texas (Austin), California (Berkeley), and Louisville.

As always we have enjoyed the assistance of our colleagues here at the Printing House. Personnel from the Printing and Educational Aids, Talking Book, Data Processing, and Editorial departments have participated directly in many projects. Support from all other departments has been extremely helpful.

#### Progress in Specific Research Activities

What follows is a listing of our various research tasks with summaries of the progress made in each project. The project leader responsible and assistants are identified at the end of each project description. As always, Ken Coy, our educational materials development technician, made substantial contributions to many of our projects.

#### A. Facilitating Listening as a Medium for Education of the Visually Impaired

Since 1960 the American Printing House for the Blind (APH) has been conducting research in listening. This research has been



both basic and applied in that it has investigated learning through listening and also been directed toward the development of equipment and materials for use in aural study. The research done during Fiscal 1974 was supported through a grant from the Department of Health, Education, and Welfare's Office of Education. This support will be continued during Fiscal 1975.

#### Research Conducted during Fiscal 1974

##### 1. Field test of the production prototype of the APH Aural Study System as an encyclopedia source

During the past several years APH developed an aural study system specifically designed for use by the visually handicapped. Although originally designed as a source for text materials, its possible application as a reference source was readily apparent.

This system was selected as a means for offering the 1973 edition of The World Book Encyclopedia to the blind and physically handicapped. During Fiscal 1974 the recording of the text of this encyclopedia was started in the Talking Book Studios of APH. Simultaneously, the design of the special record player that is a part of this system has been perfected, the final form and format for the records has been under study, the format for the written index materials that accompany the records has been researched, and the final packaging design has been tentatively determined.

When working models of the production prototype of the record player became available, these were field tested along with their accompanying materials. After accumulating data for 6 weeks on legally blind students in grades 7-12, a decision was made to redesign slightly the indexing format of the records and their accompanying written indexes. The purpose was to make possible more efficient search. During the field test information was also accumulated regarding use of the record players and some remaining problems were identified.

This has been a cooperative project with Field Enterprises Educational Corporation, the publisher of The World Book Encyclopedia. Field's personnel have done much of the editing necessary in preparing the encyclopedia for recording and their personnel have worked with APH personnel on the packaging design. Kimball International's engineers have worked closely with APH personnel in perfecting the design of the record player. June Morris was responsible for the field testing assisted by Carson Nolan and Elizabeth Hurko.

##### 2. Exploration of tonal index systems for open reel and cassette tape recordings

Five six-character tonal index codes were compared for ease of learning using sighted college students as subjects. Each character of all codes was composed of one or two elements. The elements used in

the first code were long and short tones, those in the second code were low and high-pitched tones, and those used in the third code were tones ascending and descending in pitch. The dimensions used in the first two codes were combined to form the characters in the fourth code while dimensions from all the first three codes were combined to form the fifth code.

Five comparable groups of 20 subjects were used. Each group was taught the names of the characters of one code using the paired-associates learning method. Two consecutive errorless trials was the criterion for learning. The code composed of long and short tones far surpassed all others in ease of learning.

This was a cooperative project with the Perceptual Alternatives Laboratory (PAL) at the University of Louisville. Carson Nolan was the APH project leader.

#### Research Planned for Fiscal 1975

1. Continuation of the field test of the production prototype of the APH Aural Study System as an encyclopedia source

As previously stated, after 6 weeks of field testing of the production prototype of the APH Aural Study System as an encyclopedia source, a decision was made to slightly redesign the indexing format of the records and their accompanying written indexes. These have been revised accordingly and will be tested in a continuation of the field test. Subjects will continue to be legally blind students from grades 7-12. June Morris will be responsible for this work assisted by Debbie Hill.

2. Exploration of the usefulness of the APH Aural Study System as a source for a high school level dictionary and a thesaurus

In an effort to expand the application of the APH Aural Study System as a reference source, the feasibility of production and use of additional reference works in recorded form will be investigated. The works to be studied during Fiscal 1975 are a high school level dictionary, probably the paperback edition of The American Heritage Dictionary of the English Language, and a thesaurus, The New Roget's Thesaurus in Dictionary Form. These works were selected after review of many dictionaries and thesauri because they were published in a format that, generally, seemed suitable for recording. They will be edited and recorded in a manner similar to the encyclopedia. After the recordings and their associated written indexes have undergone expert review, the materials will be subjected to use by legally blind students from grades 9-12. The results of this tryout will be evaluated to determine the usefulness of such materials in recorded form. This study will be conducted by June Morris assisted by Debbie Hill.

### 3. Evaluation of tonal code use by the visually handicapped

A six-character code composed of short and long tones will be tested in use with visually handicapped students. Twenty-four students from grades 7-12 will learn to associate names of six different parts of a social studies text with the characters of the code. They will then be trained to use the code to find parts of the book when recorded on both sides of a C-90 cassette. Finally, they will be tested for speed and accuracy in locating both parts on a second similar recording. This will be a joint project with PAL, with Carson Nolan as APH project leader.

### 4. Comparison of three vocal index systems for use with tape systems

Three vocal index systems will be compared for ease of use with cassette recordings. These include recording index information on the same track as text content, use of four-track systems to provide index information, and use of the Zimdex. Twenty-four visually impaired students in grades 7-12 will serve as subjects. Recordings will be made of junior high social studies materials and duplicated on C-90 cassettes using each of the index systems. Separate material will be used to train and test the subjects. Subjects will be trained to use each index system and then be tested in its use. Time and accuracy for location will serve as criteria. Carson Nolan is project leader in this joint project with PAL.

### 5. Exploration of the feasibility of publication of a dictionary in cassette form

An alternate to the dictionary on discs is a dictionary in cassette form. This has strong appeal since special players are not necessary. The dictionary material used in the disc project will also be used in this project. Costs will be computed for producing dictionary passages of equal time length in both disc and cassette form. Data from the vocal index project will be used to select the index mode. Subjects used in the evaluation of the disc dictionary will be taught to use the cassette dictionary. The cassette and disc systems will be compared for search times and accuracy for finding identical items. Carson Nolan and June Morris will conduct this project in collaboration of PAL.

## B. Basic Research in Tactual Perception

### Research Conducted during Fiscal 1974

#### 1. Locating symbols on a tactile pseudomap under different frames of reference

Previous research has shown that students neither define the extent of a tactile display nor initiate a preliminary scan prior to attempting a detailed search. The specific focus of this study was to determine the effects that a frame of reference, acquired from a 2-minute preliminary scan, would have on students' ability to locate



symbols on a tactile pseudomap. The test task consisted of locating as many of 16 point symbols and 6 area symbols as could be found in a 5-minute period. The results showed that a frame of reference with specific instructions on how to search the display facilitated the performance of the students in the lower grade levels (4-6), but interfered with or had no effect on students performance in the upper grades. A final report of this research has been completed. This research was conducted by Edward Berla' and Marvin Murr.

2. The effects of three different frames of reference on the location of bounded areas on a political pseudomap

A typical tactile political map consists of a series of interconnecting lines forming a number of embedded shapes. A systematic preliminary scan of such a display should provide the student with specific information as to the nature of the shapes on the display. The present study attempted to determine whether a frame of reference in the form of a systematic preliminary scan of a raised line political pseudomap would facilitate blind students performance in locating and tracing bounded political entities. There were three conditions in the experiment:

A. Control group--this group was not permitted a preliminary scan of the map nor were they instructed on how to search the map. B. Experimental group 1--this group was not permitted a preliminary scan of the map, but was trained to search the map systematically using a vertical search pattern. C. Experimental group 2--students in this group were trained to systematically search a display using a vertical search pattern and given a 3-minute preliminary scan of the map before being given the test task. The test task for all groups consisted of locating six separate shapes on the map, one at a time. The results of this study are currently being analyzed and a final report will be written during Fiscal 1975. This research was carried out by Edward Berla' and Marvin Murr. It was supported by a grant from the Bureau for Education of the Handicapped, U.S. Office of Education.

3. Comparison of the effects of different formats for representing bounded space on recognition of specific areas on tactile political maps

It was proposed in last year's report that a study be undertaken to determine which of several different kinds of map designs would facilitate map reading performance. However, it soon became apparent that information was lacking on the specific problems students have in reading tactile political maps. Consequently, it was decided to undertake a videomatic study of students working with tactile political maps to learn more about specific problems. Thirty-six braille students in grades 4-12 participated in the study. Each student was given a political pseudomap constructed by using six states of the United States randomly placed on the map and connected by additional boundary lines. Each student was presented with individual cue cards showing one of the six states which had to be found within 5 minutes on the map.

Each student's performance was videotaped for subsequent analysis. On the basis of time and error scores the nine best and the nine poorest readers were selected and their videotapes were subsequently analyzed. There were several characteristic differences between poor and good readers. Two of the most significant differences were that poor readers have substantial difficulty in tracing lines and trace less frequently than good readers. Secondly, good readers characteristically search for and discriminate the shapes on the map by noting distinctive features of the shapes. Poor readers engage in this activity less frequently.

In addition, the 36 students were interviewed and 61% (22) responded with specific problems or suggestions about maps. Ninety-one percent of these students stated that the map was difficult to read because the bounded areas were too close together and/or suggested that the areas needed to be separated.

The results of this study suggest that maps should be designed to facilitate tracing and to emphasize distinctive features. Further analysis of this study and a final report will be completed during Fiscal 1975. This research was carried out by Edward Berla', Larry Butterfield, and Marvin Murr. It was supported by a grant from the Bureau for Education of the Handicapped, U.S. Office of Education.

#### 4. Tactile map scanning and the organization of space

One of the primary purposes of maps is to convey information about space and spatial relationships. This study was an attempt to determine whether specific training in scanning a tactile display would enable blind students to organize the spatial relationships presented more effectively than students not so trained. In this study, 36 braille students in grades 4-12 were asked to inspect a tactile display consisting of nine removable symbols. After inspecting the display the nine symbols were removed and the students were asked to replace the parts in their correct location. There were two groups: A control group which received no training and an experimental group which was trained to systematically search the display using a vertical search technique. The results show that the students in the lower grade levels benefited most from the training and were superior to the control group in the same grades. However, training interfered with the performance of the students in the upper grade levels (10-12) with the control group performing better than the experimental group. Apparently, training is effective before strong habits have been established. Statistical analysis of this data and a final report will be written during Fiscal 1975. This research was conducted by Edward Berla' and Marvin Murr. It was supported by a grant from the Bureau for Education of the Handicapped, U.S. Office of Education.

#### 5. Questionnaire study on the problems and solutions inherent in the use of tactile political maps

A letter was sent to each superintendent of every school for the blind in the U.S. and one in Canada requesting that APH be put in

contact with any individual who had experience in working with maps with blind children. When these names were received a second letter was sent requesting their participation in a questionnaire study on tactile maps. Twenty-one individuals or groups responded with specific problems or solutions concerning maps. The problems and solutions are currently being categorized and a master list will be constructed. Hopefully, at least some of the problems and solutions suggested will be the basis for subsequent research. When the master list is completed all participants will be sent a copy. This study was carried out by Edward Berla' and Marvin Murr.

## 6. Stimulus legibility and symbology

### a. Line width discrimination

As indicated in last year's report, a study was completed on the tactual discrimination of line width. This research showed that as the width of a standard line decreased a greater proportion had to be added to or subtracted from a comparison line before the two lines appeared different to 95% of the braille students. Because this result was quite unexpected, a second study was carried out with a different procedure and with different subjects. The results were almost identical to last year's research. A final report of both studies has been completed. This research was carried out by Edward Berla' and Marvin Murr.

### b. Angle size discrimination

The purpose of this study was to determine differences in the size of angles that could be discriminated 90% of the time. Thirteen different standard angles ranging from  $5^{\circ}$  to  $175^{\circ}$  were tested. Subjects were presented with a standard angle on one tactile protractor and had to adjust a variable protractor until it was equal in size to the standard. Using this procedure the amount and direction of error could be obtained. This study has been completed and an analysis of the data is proceeding. A final report will be written during Fiscal 1975. This research was carried out by Edward Berla' and Marvin Murr.

## Research Planned for Fiscal 1975

### 1. Comparison of different map formats for representing bounded space on tactile political maps

The results from last year's research indicated students' problems with discriminating the shapes of divisions on political maps. This research will explore ways to separate, physically, the bounded areas of maps so that each shape will be perceptually separate and distinct. The basic research strategy will be to develop different map formats and to compare empirically each of the new formats with the typical single raised line format now employed in braille atlases and textbooks. Initially, a videomatic pilot study will be undertaken to determine obvious problems students have using the different formats



and then, with the refined map designs, a more extensive empirical test will be made. The study will consist of the following four designs: Map A will represent the political divisions with a continuous line separating the different areas. This map will be an analogue of a print outline map and is the typical format for political maps now used in braille atlases and textbooks. Map B will be constructed by taking Map A and inscribing a line around the contour of the inside of each bounded area and then the original contour line will be eliminated. This procedure will, in effect, shrink the size of each bounded area and leave a space between adjacent bounded areas. However, the contour line around the whole map will still be preserved. Map C will be constructed the same as Map B, but instead of having two lines with a space between, there will be a relatively broad line separating the shapes. Map D will be constructed the same as Map B, but a light texture will be added to the space between adjacent areas. The subjects' task will be to locate and trace several bounded areas on the map. This research will be carried out by Edward Berla'.

## 2. Comparison of trained and untrained readers on recognition of bounded areas on political maps

A finding in the previously reported videomatic study was that poor map readers have difficulty in tracing lines and trace lines less frequently than good map readers. In this study, students who obtain scores below criterion on a pretest of map reading skill will be trained in line tracing and picking out distinctive features. Each student in the experimental group will be trained to trace using the two index fingers and taught the concept of a distinctive feature of a shape. During the tracing session the students will be asked to trace and pick out the distinctive features of 10 different shapes. A control group will receive no training. Both groups will be tested on speed and accuracy of locating and tracing bounded areas on a tactile map. This research will be conducted by Edward Berla'.

## 3. Tactual symbology

Research will continue during Fiscal 1975 to determine the discriminability of tactual symbols. The choice of the particular tactile dimension and the details of the study have yet to be made.

## C. Educational Materials Research and Development Supported through the Instructional Materials Reference Center (IMRC)

For several years, a grant from the U.S. Office of Education has supported a variety of educational materials development activities as well as educational materials reference services. The following projects received support from this source.

## 1. Science program

### Educational Materials Development during Fiscal 1974

#### a. Introductory simple machines

The introductory simple machines were field tested during Fiscal 1974. The study evaluated the ability of young visually handicapped students to identify and manipulate the parts of each machine. The manipulation tasks included were considered basic to learning fundamental physical science concepts. A total of 27 students from 7 to 13 years of age were tested. The percentages of students correctly performing the manipulation tasks for the machines were: lever--98%, wheel and axle--97%, inclined plane--94%, pulley--92%. Performance scores for older vs. younger students revealed no significant differences between the two groups. Frank Franks was project leader assisted by Larry Butterfield.

#### b. Individualized science activities for the visually impaired

The purpose of this project was to develop science activities for the upper elementary grades. These are designed to give the student a personalized experience in science and to develop the student's independence in exploring various types of equipment and scientific concepts. Twenty-five possible activities were developed and reviewed. These included projects in sound, light, physiology, friction, and other areas. Eight of these were selected for further development. This was a joint project with the Lawrence Hall of Science at the University of California (Berkeley). Carson Nolan and Frank Franks shared APH responsibility for this project.

### Educational Materials Development Planned for Fiscal 1975

#### a. Evaluation of individualized science activities for the visually impaired

Eight science activities developed last year will be reproduced and field tested. Four of these activities deal with sound and four deal with human physiology. In addition, several other activities dealing with light will be brought to final form and evaluated as time permits. As before, this is a joint effort with Lawrence Hall of Science. Carson Nolan and Frank Franks are project leaders.

## 2. Mathematics program

### Educational Materials Development during Fiscal 1974

#### a. Tactile ruler familiarization unit

A total of 37 legally blind primary grade students were tested on their ability to discriminate tactile linear symbols embossed on thermoformed sections of the APH Tactile Ruler and their ability to develop the concepts of "inch" and "centimeter." Students exceeded the criterion of

80% correct on tasks requiring the counting of inch and centimeter lines. The high performance of students on discrimination of these linear symbols on the ruler sections indicates that measurement activities using the APH Tactile Ruler can begin as early as the first grade with prior instruction using the tactile ruler familiarization unit. In conversion from centimeters to inches on the ruler sections, students again exceeded the 80% criterion. However, students experienced greater difficulty in conversion from inches in tasks involving either half inches or half centimeters. Frank Franks was project leader assisted by Larry Butterfield.

#### b. Geometric forms

In a pilot study, 10 students from grades 1-3 were able to identify the shapes of simple geometric forms (triangle, square, and circle) when represented as curves, tangible plane figures, and three-dimensional shapes. Since this set of educational aids is an introductory set to the Mitchell Wire Forms which have enjoyed wide success with older blind students for a number of years, no further evaluation was considered necessary.

The set consists of raised line figures of a triangle, a square, and a circle on thermoformed plastic; tangible plane figures of each shape; and three-dimensional solids of a cube, a pyramid, and a sphere which pulls apart into two equal halves. Frank Franks was responsible for this development.

### 3. Social studies

#### Educational Materials Development during Fiscal 1974

##### a. Simplified continental relief maps

Simplified continental relief maps of Europe and South America were developed and reviewed by experts in geography and in tactile perception to determine the legibility of the geographical features on the maps. Educators evaluated their appropriateness as instructional aids in social studies for young blind students. Expert review of the maps of Europe and South America indicated that greater exaggeration, repression, and incision of some features and symbols were required. Subsequently, these changes were made on prototypes of these maps. Frank Franks and Larry Butterfield were responsible for this project.

##### b. Maps in the classroom and school environment

The objective of this project was the development and evaluation of an instructional program designed to teach young blind students that a known environment can be represented abstractly on a simple map. The program consists of 80 lessons in two equal parts with tangible aids (e.g., symbols of chairs and tables, simple maps) and progresses from manipulation of concrete objects (gross motor movement) in a known environment to manipulation of abstract symbols (fine motor movement) on simple maps.



Part 1 of the program is designed for use with students as young as 3 years of age and teaches 20 basic locational and directional referents (e.g., middle, between; far, near; left, right) using chairs and tables within the classroom. In Part 2, lessons apply the concepts and relationships from Part 1 to operations involving symbols and their use on simple maps.

The program utilizes a diagnostic/prescriptive approach to teaching concepts which underlie basic map reading comprehension and the development of fundamental map reading skills. Each section of 10 lessons is preceded by 40 criterion tasks. The criterion tasks are administered and the teacher utilizes performance responses to determine the student's understanding of a particular concept and to diagnose deficiencies. Prescriptions are written to provide the instruction necessary to remediate the student's deficiencies. Upon completion of the remedial instruction, a follow-up evaluation is administered. Record sheets are provided for recording responses and observations.

The instructional program has been drafted and is being presented to young blind students in four residential and two public school programs. Project leader for this research was Frank Franks assisted by Chris Kephart.

#### c. Lesson guides for geographical readiness concepts

The guides for geographical readiness were designed to provide experiential readiness activities in geography for visually handicapped children. They consist of nine lessons related to actual experience in the environment and in the classroom, references to current curricular material in geography, and references to sources for the materials used in each lesson. The lesson guides also include a statement of the concepts introduced in each lesson and the materials needed to conduct the lesson.

Specifications for the lesson guides were completed during the fall of 1973. Concepts included in the lessons were selected from those presented in the Landform Models and through a review of beginning geography textbooks. A first draft of the lesson guides was written during January, 1974, and reviewed by an APH in-house committee. Revisions based on this review were made and the lesson guides were placed in the field for an in-depth review by expert teachers of visually handicapped children. An analysis of the evaluation questionnaire indicated that the materials were appropriate for developing geographical readiness skills. Hilda Caton and Larry Butterfield were responsible for the work on this project.

#### d. Individualized auditory instructions for Landforms

Three years ago APH developed a set of Landforms with an instructional program for teaching 40 common geographical features to blind students. These instructional materials require extensive teacher-pupil interaction. The purpose of this project is the development

of an auditory program to facilitate independent study of geographical concepts by blind students. The individualized instructional modules will allow students to proceed at their own rate and to become actively involved with exploration of Landforms as they proceed.

The program consists of eight cassettes. The presentation of the instructional program follows a "Sesame Street" format in which a variety of interesting characters present the geographical concepts with auditorially stimulating sound effects. Dr. Jack Miller, George Peabody College, developed this program in coordination with Frank Franks.

#### Educational Materials Development Planned for Fiscal 1975

##### a. Simplified continental relief maps

The simplified continental relief map project will be completed in Fiscal 1975. Relief maps of Africa, Asia, and Australia will be developed and reviewed following procedures developed previously in this project. Frank Franks and Larry Butterfield will complete this work.

##### b. Maps in the classroom and school environment

The first draft of the instructional program has been completed and will be used by teachers who will evaluate its appropriateness for young blind students and who will provide input for finalizing the program for evaluation. Completion of the final draft of Part 1 is scheduled for December, 1974. Participating educators will meet in Louisville in December to make final revisions. Completion of Part 2 is scheduled for May, 1975. Participating teachers again will meet to make final revisions in Part 2. Final versions of the program will be sent to educators who have not participated in its development for evaluation. Frank Franks and Chris Kephart will complete this study.

##### c. Individualized auditory instructions for Landforms

The individualized auditory program for using Landforms to teach 40 basic geographical concepts will be evaluated. Evaluation will consist of determining the extent to which blind students in grades 1-6 can learn the 40 concepts using the program. A control group will be employed. Dr. Jack Miller, George Peabody College will conduct this evaluation with Frank Franks.

#### 4. Auditory and oral language skills

##### Educational Materials Development during Fiscal 1974

##### a. Adaptation of the "Listen and Think" materials

Levels E and G of Educational Developmental Laboratories' "Listen and Think" taped lessons were adapted, field tested, and revised. Sixty-eight students completed trial use of one of the two programs and eight teachers submitted recommendations for revisions. Fay Leach was assisted by John Cardinale and Elizabeth Hurko in the project.

b. Survey of major preschool language development programs

Information was obtained on more than 200 materials dealing with language development skills at the preschool and primary level. Evaluation of the materials was coordinated with a committee from the State of Illinois Instructional Materials Center. Few of the commercial materials in early language development appeared useful for visually handicapped students without major adaptation or development. Five programs were purchased for additional evaluation for possible adaptation. Fay Leach was assisted by John Cardinale in the survey.

c. Development of experience relevant stories

A workshop was held during August 1973 to outline specifications for the types and formats of materials needed by young visually handicapped children to develop audiolinguistic skills. Participants of this institute became members of the project's advisory committee. In October 1973 a 2-day planning meeting was held with the project directors and the head consultant, Dr. Verna Hart. Initial prototypes and scripts implementing the specifications were developed subsequent to these two meetings. These materials were reviewed by the advisory committee during a 3-day workshop during June 1974. Revisions based on the recommendations of the committee are being made. Hilda Caton and Fay Leach were responsible for this work.

d. Rules for talking to visually handicapped children

The cassette-slide series, "Rules for Talking to Your Child," was reviewed by an APH in-house committee. This series was judged valuable and it was recommended that it be presented in an illustrated printed format which could be used individually. Three such booklets were developed, reviewed, and revised. Subsequently, these booklets were reviewed by the advisory committee. A final draft will incorporate format and content suggestions made by the committee. These booklets will be illustrated parent/teacher guidebooks and will be coordinated with and accompany the three basic units of auditory and oral language materials currently being developed. Fay Leach was responsible for this task.

### Educational Materials Development Planned for Fiscal 1975

a. Adaptation of the "Listen and Think" materials

Level H and I of Educational Developmental Laboratories' "Listen and Think" taped lessons will be adapted and field tested by Fay Leach and Eleanor Pester.

b. Materials for very young children or multi-handicapped

Prototype units of materials are being adapted for children functioning on the following levels:



- I Children who receive language but do not recognize it
- II Children who have receptive language but little expressive language
- III Children who have expressive language with few concepts
- IV Children who have receptive and expressive language but are still functioning at less than first grade level

The basic unit for each level consists of: (a) an illustrated Parent/Teacher Guide in pamphlet form which contains information about the child and his functioning at that level and lists activities appropriate for the child; (b) activity outlines on cards for each level; and (c) cassette tapes containing demonstrations of activities for the teacher as well as adapted stories and activities to be used by the child.

Prototypes of materials developed for Levels I, II, and III will be completed and placed in the field for evaluation. Materials for Level IV will be developed by adapting preschool language programs selected for this purpose. Fay Leach and Hilda Caton will be assisted by Eleanor Pester in the development and evaluation of these materials.

## 5. Primary braille reading materials

### Educational Materials Development during Fiscal 1974

#### a. Tactual discrimination worksheets

These worksheets consist of four parts: Part I--Geometric Forms, Part II--Lines, Part III--Angular Figures, Part IV--Braille Characters. They are accompanied by a pamphlet of instructions for performing the tasks for each page. The worksheets are designed to provide visually handicapped children with experience and training in tactual discrimination. The tasks involved in all four parts of the worksheets are purely discriminatory in nature. At no time are students required to name the figures.

During Fiscal 1974, the worksheets were field tested with 89 students who were braille readers or potential braille readers in grades K-3 in seven residential schools for the visually handicapped. Item difficulties were obtained for the figures within each of the four parts and for the four parts overall. Using these data, the order of the figures in the sets and the order of the sets was revised so that the worksheets are arranged in approximate order of difficulty. Additional analyses revealed that students' ability to make the discriminations increased by grade level for all sets except the geometric forms. Students at all levels were able to follow the directions and mark the answers correctly. Work on this project was done by Hilda Caton, Elizabeth Hurko, and John Cardinale.

b. A story related approach to beginning braille drill

The set of beginning braille drill materials, My Fingers Do Good Work, was developed by Mrs. Jane Wegeholt, Illinois Braille and Sight-Saving School. The complete set of materials consists of two series of small individual books to be used by students, a pamphlet containing instructions for using the books, and a set of simple two-dimensional animal figures which may be used with the lessons if desired.

The two series of children's books are entitled "Story Workbooks" and "Activity Workbooks." They may be used at the readiness and beginning reading levels to develop skill in tactual discrimination. At more advanced levels, they may be used to teach the names of the braille characters or to review specific letter difficulties.

The production of these materials was recommended after review by the Primary Braille Reading Consulting Group. Following this review, Mrs. Wegeholt revised and reorganized the materials. In September 1973 they were reviewed by expert teachers of visually handicapped children for their effectiveness for use in instruction. Revisions based on this review were made and a final evaluation was conducted in March 1974. Recommendations from all reviewers indicated that the materials would be effective for braille drill. Hilda Caton was project director.

6. Educational measurement

Educational Materials Development during Fiscal 1974

a. Completion of the manuals for Forms A and B of the braille and large type editions of the Stanford Achievement Test

Ten manuals are required to administer the tests within this series; one for each battery of tests for both the braille and large type editions. These manuals include the general instructions for test administration, the specific instructions for administering each test within the batteries, timing information, proposed schedules for administration, scoring information, and scoring keys. In addition, the manuals accompanying the braille batteries contain norms that are specific to the braille tests within the battery that vary from their print counterparts along with all statistical data relating to the special norms. These manuals were completed and submitted to the test publisher, Harcourt Brace Jovanovich, where they were reviewed and approved. June Morris was responsible for preparation of the manuals.

b. Completion of the manuals for Forms A and B of the braille and large type editions of the Test of Academic Skills (TASK)

Two manuals are required to administer the tests within this series; one for the braille batteries and one for the large type batteries. These manuals are similar to, but not as extensive, as those described for

the Stanford Achievement Test. They too were completed and submitted to the test publisher, Harcourt Brace Jovanovich, where they were reviewed and approved. June Morris was responsible for preparation of the manuals.

#### Educational Materials Development Planned for Fiscal 1975

##### a. The Wide Range Achievement Test

This test will be adapted for publication in braille and large type and the directions for administering adapted accordingly. June Morris will prepare these materials. Publisher approval has been obtained.

##### b. The Wide Range Vocabulary Test, Forms B and C

Both forms of this test will be adapted for use by the visually handicapped by June Morris. Publisher approval has been obtained.

##### c. The Durrell Listening-Reading Series, Forms DE and EF

The tests from the three levels of this series, both forms, will be prepared for braille and large type reproduction and their accompanying directions for administering will be adapted accordingly. The latter will be submitted to the test publisher for approval. Publisher approval has been obtained for the adaptation of this series.

As there is some question as to whether the Primary Level of this test, for use with grades 1.0-3.5, can be used with visually handicapped students at all of these grade levels, use of the Primary Level of the series will be evaluated through use by students at these grade levels. Data will be analyzed to determine the grades for which use of the Primary Level of the series can be recommended. June Morris will be responsible for this project.

##### d. The Boehm Test of Basic Concepts, Form A

A tactual analog of the Boehm Test of Basic Concepts, Form A, will be developed and the accompanying directions for administering the test will be edited and modified to conform to the adaptation. The purpose of the test is to identify concepts which are needed by children as they enter school, but which are misunderstood by a sufficient number of these children to warrant specific instruction. It is appropriate for use with children in kindergarten and first grade. The tactual analog will be appropriate for visually handicapped students who now use, or who will eventually use, braille as their reading medium. An initial review has revealed that the print edition is appropriate for low-visioned students in its present form.

The test will be field tested during October 1974. Subjects will be 25 students in each of grades K-2 who are braille readers or potential braille readers. Data will be analyzed to determine whether the tactual analog will effectively perform its intended function when used with visually handicapped children. Hilda Caton is project director.



## 7. Other IMRC educational materials research and development

### Educational Materials Development during Fiscal 1974

#### a. Revision of the Chang Mobility Kit

The purpose of this study was to assess the effectiveness of the revised guide and tactual diagram materials which will comprise the new Chang Tactile Diagram Kit. These materials were sent to a group of 10 persons composed of educators, classroom teachers, and mobility specialists for formal review according to carefully defined criteria. Results of these reviews were tabulated and analyzed. Indicated modification of both the guide and tactile materials was made as required. This project was supervised by Roy Brothers.

#### b. Abacus instruction

The purpose of this project was to develop an instructional module for training teachers in use of the abacus. The module will consist of audio cassettes and a workbook. Addition, subtraction, division, and multiplication will be covered. An initial set of tapes was made and reviewed by experts. Suggestions for revisions were made and a second set of tapes prepared. Development of the workbook was initiated. This work was initiated by Roy Brothers and is being done by consultants outside APH under the direction of Carson Nolan.

#### c. Evaluation of a recorded typing curriculum

A recorded typing program to teach keyboard position and to develop skill in typing was developed by Dr. Faborn Etier of the University of Texas. This program was successfully demonstrated with visually handicapped students. The program was modified to use individual cassette recorders and a second field trial was made. This trial indicated the modification was successful. The manual for the program was revised and a script for an introductory tape for teachers was written. Carson Nolan coordinated this project.

#### d. Development of tactile games

Tactile analogs of 10 games for children were developed. These games were evaluated for ease of understanding directions and legibility of materials using small numbers of children. The Game of Squares, 10-Spot, Take Away, and Baseball were determined to be acceptable and ready for publication. Hom-A-Tex, Dominoes, Fox and Geese, and Texture Wheel appeared acceptable with modifications. The games Hang-Man and Turn-Around were rejected. Ken Coy and Elizabeth Hurko were responsible for this work.

### Educational Materials Development for Fiscal 1975

#### a. Abacus instruction

The workbook for this project will be completed and it and the revised tape program will be reviewed by experts in the field.

Further revisions will be made as required by the results of this review. Carson Nolan will monitor this project.

#### Agencies Collaborating in Research during the Year

During Fiscal 1974 we continued to receive excellent cooperation and collaboration from schools and agencies throughout the nation. Residential schools for the blind participating included Arkansas, Florida, Georgia, Indiana, Kentucky, Lavelle, Maryland, Michigan, Missouri, New York State, Ohio, Overbrook, South Carolina, Tennessee, Texas, W. Ross MacDonald, Washington, and Wisconsin. Public school programs participated in Georgia and Virginia.

#### Research and Development Personnel for Fiscal 1974

Berla', Edward, PhD - Behavioral Research Scientist

Brothers, Roy, EdD - Behavioral Research Scientist

Butterfield, Larry, MA - EMR&D Assistant

Cardinale, John, MA - EMR&D Assistant

Caton, Hilda, Ed. Spec. - EMR&D Specialist

Coy, Ken - EMR&D Technician

Franks, Frank, EdD - Senior EMR&D Specialist

Hurko, Elizabeth, BA - EMR&D Assistant

Leach, Fay, EdD - EMR&D Specialist

Lee, Linda - Secretary

Morris, June, MA - Behavioral Research Scientist

Murr, Marvin, BA - EMR&D Assistant

Nolan, Carson, PhD - Coordinator; Educational Research, Development,  
and Reference Group

Pinson, Pamela - Secretary

## Publications

- Berla', E. P. Tactual orientation performance of blind children in different grade levels. American Foundation for the Blind, Research Bulletin, 1974, No. 27, 1-10.
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- Nolan, C. Y. Educational research and development at the American Printing House for the Blind. In International Council of Educators of Blind Youth, Fifth quinquennial conference, July 25-August 2, 1972. Madrid, Spain: Torregón de Ardoz, 1974. Pp. 57-65.
- Nolan, C. Y., Brothers, R. J., & Morris, J. E. Aural study systems for the visually handicapped: Guide to efficient study through listening: Interim progress report no. 11. Louisville, Ky.: American Printing House for the Blind, 1973. [Project No. 8-0046; Grant No. OEG-0-8-080046-2670(032)]
- Nolan, C. Y., Morris, J. E., & Brothers, R. J. Aural study systems for the visually handicapped: Final report. Louisville, Ky.: American Printing House for the Blind, 1973. [Project No. 8-0046; Grant No. OEG-0-8-080046-2670(032)]



## Consultants during Fiscal 1974

Consultants in Social Studies

- Dr. Donald E. Bierman, Chairman, Geography Department, University of Louisville, Louisville, Kentucky
- Mrs. Pat Carpenter, Consultant, DeKalb County School System, Scottdale, Georgia
- Mr. Gary Coker, Principal, Tennessee School for the Blind, Nashville, Tennessee
- Mrs. Rebecca Crowell, Teacher, Tennessee School for the Blind, Nashville, Tennessee
- Mrs. Margaret A. Davis, Teacher, South Carolina School for the Deaf and Blind, Spartansburg, South Carolina
- Dr. Rebecca DuBose, Associate Professor, Department of Special Education, George Peabody College, Nashville, Tennessee
- Dr. Denzil Edge, Assistant Professor, Special Education Department, University of Louisville, Louisville, Kentucky
- Mrs. Edith Georgi, Elementary Social Studies Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Mrs. Mildred Howard, Teacher, Georgia Academy for the Blind, Macon, Georgia
- Mrs. Christine Kephart, Kindergarten Teacher, Florida School for the Deaf and Blind, St. Augustine, Florida
- Mrs. Ina Kurzhals, Curriculum Director, Utah School for the Blind, Ogden, Utah
- Mr. Dan Miller, Education Specialist, Virginia Commission for the Visually Handicapped, Richmond, Virginia
- Mr. Marvin Sanford, Physical Education Teacher, Florida School for the Blind, St. Augustine, Florida

Consultants in Science

- Mrs. LaRhea Sanford, Elementary Science Teacher, Florida School for the Deaf and the Blind, St. Augustine, Florida

### Consultants in Auditory and Oral Language Development

- Mrs. Carol Cline, Resource Teacher, Tallahassee Public Schools,  
Tallahassee, Florida
- Dr. Verna Hart, Associate Professor, Department of Special Education,  
University of Pittsburgh, Pittsburgh, Pennsylvania
- Mrs. Pamela Hoffman, Preschool Program, Dallas Services for Blind  
Children, Dallas, Texas
- Mrs. Kathryn Horton, Chief, Language Development Program, Bill  
Wilkerson Speech and Hearing Center, Nashville, Tennessee
- Mrs. Kay Loss, Language Program, Arkansas School for the Blind,  
Little Rock, Arkansas
- Mrs. Rosemary O'Brien, Coordinator, Montgomery County Schools,  
Rockville, Maryland
- Miss Eleanor Pester, Teacher, Northwest Indiana Special Education  
Cooperative, Highland, Indiana

### Consultants on Primary Braille Reading

- Miss Freda Henderson, Curriculum Director, Tennessee School for the  
Blind, Nashville, Tennessee
- Miss Emma Rowe, Teacher, Dade County Public Schools, Miami, Florida
- Dr. Evelyn Rex, Associate Professor, Illinois State University,  
Normal, Illinois
- Mrs. Sara Schell, Teacher, Atlanta Public Schools, Atlanta, Georgia
- Miss Eleanor Pester, Teacher, Northwest Indiana Special Education  
Cooperative, Highland, Indiana

### Consultants in Abacus Instruction

- Dr. Mae Davidow, Former teacher, Overbrook School for the Blind,  
Philadelphia, Pennsylvania
- Mrs. Marian Lewis, Former teacher, Tennessee School for the Blind,  
Nashville, Tennessee
- Miss Janice Hattendorf, Attorney, Fort Wayne, Indiana
- Mr. Fred Gissoni, Supervisor, Rehabilitation Center for the Blind,  
Louisville, Kentucky





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## Educational Research, Development, and Reference Group

### Report on Research and Development

### Activities - Fiscal 1975

Progress during fiscal 1975, with one exception, continued at the steady pace set by previous years. Our research and development program continued to be both longitudinal and diversified. Projects focused on listening, science, mathematics, social studies, teacher training, language development, educational measurement, and tactual perception.

Cooperation received from the schools and individual administrators, college personnel, teachers, and students was excellent. As our consulting lists show, a broad spectrum of people from the visually impaired field participated directly in our projects. We maintained active cooperative projects with George Peabody College and the University of Louisville.

We continued to receive support from the Bureau for Education of the Handicapped (BEH), U. S. Office of Education, for many of our projects. We are extremely grateful for this assistance. Our major source of support over the past 6 years had been the BEH grant for our Instructional Materials Reference Center (IMRC). This support was terminated in August 1975. To replace it, we bid on and were awarded a contract for the Special Office for the Visually Impaired (SOVI), which is part of the new Area Learning Resource Center Network. While this award equaled that for our IMRC, unexpectedly heavy federal requirements for information services activities resulted in far less actual money being available for research. Consequently, our research program for fiscal 1976 will be curtailed by about 20%. An immediate consequence of this curtailment is our inability to replace Dr. Edward Berla, whose services we lost to the University of Louisville.

Our Printing House colleagues and our administration have been extremely helpful in facilitating our work during the year.

### PROGRESS IN SPECIFIC RESEARCH ACTIVITIES

What follows is a listing of our various research tasks with summaries of the progress made in each project. The project leader responsible and assistants are identified at the end of each project description. As always, Ken Coy, our educational materials development technician, made

substantial contributions to many of our projects. The source of financial support for the projects will be indicated at the end of the title for each. (APH) will indicate Printing House support, (SOVI) will indicate support from this contract, and (BEH) will indicate support from other BEH-USOE grants

#### A. Facilitating Listening as a Medium for Education of the Visually Impaired

The use of listening as an educational medium has been an area in which APH has had an ongoing interest for many years and for which it has maintained a continuing research program. Currently, the emphasis of this program has been on the adaptation and/or design of materials and on techniques to enhance the use of listening as a study skill.

#### Research Conducted during FY 1975

##### 1. Continuation of the field test of the production prototype of the APH Aural Study System as an encyclopedia source (BEH)

In the last annual report a brief description was given of a field test of a system composed of an indexing disc record player, special indexed records, and accompanying written index material. This was then thought to be the production prototype for a recorded encyclopedia package. After a number of weeks in the field, a decision was made to discontinue the field test and to redesign the indexing format of the records and their accompanying written indexes to provide for easier use. At the same time, it was noted that there were some features of the player that needed refining. During this past fiscal year the redesigned materials were subjected to a field test. Twenty-six legally blind students from grades seven through high school postgraduate participated. Each was individually trained for three class periods and then tested during a fourth.

Two important and related findings gleaned from the data collected during the field test were: (a) the greatest single problem students had in use of the materials was in determining the correct alphabetical position of sought items and (b) because of this, sought items had the greatest probability of being located if they were listed on the written index.

June Morris was responsible for the field test. She was ably assisted by Debbie Hill.

Regretfully, further work on publication of a disc encyclopedia has fallen victim to the recession. The company with whom APH had contracted to make the models of the record players being tested and with whom it was expected to contract for the production models, indicated they were no longer interested in the project as it would not be profitable. Because of this and the recession, Field Enterprises Educational Corporation, publisher of The World Book Encyclopedia, temporarily withdrew support for recording their encyclopedia. However, Field Enterprises has expressed interest in renewing this project when economic factors permit.

##### 2. Exploration of the usefulness of the APH Aural Study System as a source for a high school level dictionary and a thesaurus (BEH)

This project was dropped; at least for the time being. Its purpose was to expand application of the APH Aural Study System as a reference source. Until and unless there is a satisfactory resolution to the equipment problem for the Aural Study System, expansion of its use is not a practical nor viable research question.

### 3. Evaluation of the use of a six character tonal code in finding parts in a textbook (BEH)

Previous research evaluated five types of tonal codes for tape indexing and identified a six-character code composed of long and short tones as most easily learned. This year, 24 braille or large type readers in grades 7-12 were taught this code and trained to use it to find parts in a textbook. Simulated text materials were recorded on a two-track cassette with the tonal index signals recorded at a low frequency audible only when the APH cassette player was operated at rewind or fast-forward.

All students were able to learn the index code in less than 40 trials with median scores of 11 trials. Working with a history text recording of 100 minutes duration, students were able to locate exact book parts with 92% accuracy and within an average time of 2 minutes. This level of performance was judged adequate for practical use.

This was a cooperative project with Dr. Emerson Foulke of the University of Louisville. Carson Nolan and Marvin Murr were the APH participants.

### 4. Comparison of three vocal index systems for use with tape systems (BEH)

Three vocal index systems were compared for ease of use with cassette recordings. These included recording index information on the same track as text content, use of four-track systems to provide index information, and use of the Zindex. Twenty-four visually impaired students in grades 7-12 served as subjects. Recordings were made of junior high social studies materials and duplicated on C-90 cassettes using each of the index systems. Separate materials were used to train and test the subjects. Subjects received 1 hour of training on each system and then were tested on their ability to find book parts exactly on a 100-minute recording. While from a statistical standpoint, the two-track system with index information recorded on the same track was superior, accuracy of use and location times for all these systems fell within the limits for practical use.

This was a cooperative project with Dr. Emerson Foulke of the University of Louisville. Carson Nolan and Marvin Murr were APH representatives.

## Research Planned for FY 1976

### 1. Exploration of the feasibility of publication of a dictionary in cassette form (BEH)



This study was originally planned for fiscal 1975; but was delayed until fiscal 1976. It has been expanded into two separate studies directed at different aspects of the problem. In the first, adults will be used to evaluate a recorded selection from an adult dictionary. In the other, students will be used to evaluate a recorded selection from a junior level dictionary. In both, the recorded materials will be such that they can be played on standard APH four-track cassette recorders.

a. A review by adult consumers

The purpose of this study is to compare two methods by which dictionaries recorded on cassettes can be indexed vocally and to query potential consumers on a number of critical questions for which answers are needed prior to recording a dictionary. These regard needs and uses for dictionaries; the need for the spelling of words in definitions such as irregular forms, difficult or important words within definitions, synonyms, etc.; and the advisability of including etymologies. Experimental cassettes containing a 2-hour selection from The American Heritage Dictionary of the English Language will be used to demonstrate two methods by which vocal indexing can be achieved (i.e., same track indexing and parallel track indexing). Thirty adults who might be consumers will be included in the survey. Of these, 10 will be mature blind consumers, 10 will be teachers of high school level blind students, and 10 will be librarians in residential schools for the blind.

June Morris will collaborate with Dr. Emerson Foulke of the University of Louisville in this study. She will be assisted by Debbie Hill.

b. Media comparison study

Previous research conducted by the APH has shown that persons who are legally blind can use recorded reference materials when presented on records or discs. The purpose of this study will be to expand on this information by comparing the time and accuracy for the location of dictionary entries when provided on audio cassettes, in braille, and in large type by students who normally read either braille or large type.

The recorded material to be used will be a vocally indexed 2-hour selection from the Thorndike-Barnhart Junior Dictionary. Similar materials will be available in braille and large type. Subjects will include 16 legally blind students from grades six and seven.

June Morris will be assisted by Debbie Hill and Margaret MacDougall in this study.

2. Exploration of an indexing cassette system to supply recorded references to the blind (BEH)

Previous research resulted in development of an indexible disc recording system and in successful demonstration of its usefulness. The current recession halted applying this system in publication of a popular encyclopedia. This interruption, although disappointing, provided an interval to explore the application of recent developments in cassette player technology for the same purpose. For the first time, commercial cassette player components are available that make possible an indexing application at a reasonable cost. Thus, a cassette system might be an attractive alternate to the disc system originally developed.

Four working models of an indexing cassette player will be built. Simultaneously, an encyclopedia package consisting of recorded content and print indexes will be designed. An encyclopedia sample of at least 4-hours duration will be produced in the desired package. A program to train blind students to use the entire system will be written. At the same time a work sample test of proficiency in using the system will be developed. These materials then will be used to make a field trial of the system.

Bobby Phelps is the development engineer responsible for designing and building the models of the indexing cassette player. June Morris will be responsible for the design of the recorded encyclopedia and for the field trial of the combined package. She will be assisted by Debbie Hill.

### 3. Comparison of several designs for written indexes for use with a recorded encyclopedia (BEH)

In all previous work done at APH regarding recorded reference materials, the design of the written indexes necessary has been a problem of choosing between two alternates. The more information provided in the written index, the greater the time required to find a specific item on it. However, because it provides more specific location information than shorter versions of the index, longer indexes require less time to find an item on the recording and vice versa. In this study six designs for written indexes will be compared. These will vary through two styles and three amounts of information. Subjects will include 48 legally blind students, half readers of braille and half readers of large type, who will be drawn from grades 7-12. Data gathered will describe time and accuracy necessary for item location. From information obtained in this study, the index style(s) to be used in the field trial of the cassette reference system will be determined.

Debbie Hill and Larry Butterfield will assist June Morris with this study.

## B. Research in Tactual Perception

### Research Conducted during FY 1975

#### 1. Tactile political map designs for blind students (BEH)

The design of tactile political maps for blind students was investigated by constructing two experimental maps using either a broad, raised line or a broad, incised line. Performance on these two maps was compared with performance on a thin, raised line map (control) which is typically found in braille books. The subjects were 72 braille readers in grades 4-12. Performance on the broad, raised line map was superior to performance on the control map in terms of a significantly greater number of shapes being located in significantly less time. Performance on the broad, incised line map was no different than performance on the control map. Edward Berla' was assisted by Larry Butterfield and Marvin Murr in this research.

## 2. Training in recognition of tactile outline shapes (BEH)

Previous research revealed that young blind students were deficient in three shape recognition skills. These were distinctive features analysis, line tracing, and systematic search. Twenty-five students were given a 3-day training program in these skills. Pre-training and post-training scores were compared to a matched group of 25 students who received no training. Pretest and posttest materials were exactly the same and consisted of 36 shape recognition cards based on shapes of actual states and countries. Performance of trained students was 32% more accurate than that of untrained students. This research was conducted by Edward Berla' with assistance from Larry Butterfield and Marvin Murr.

## 3. Effects of tactile shape recognition training on recognition and location of states on a tactile map (BEH)

The purpose of this study was to determine if training of the nature described above actually helped in map reading. Forty-two students were pretested for accuracy and speed of location of states on a map. Two groups were selected and matched on the basis of this performance. One group received 3-days training as described in 2 above. Both groups were posttested for shape location and identification on a second map. Trained students increased their accuracy by 25% and decreased location times by 41% as compared to untrained students. Larry Butterfield and Marvin Murr assisted Edward Berla' in this study.

## C. Social Studies Materials Development

### Development during FY 1975

## 1. Individualized auditory instructions for landforms (APH)

Eleven cassette tapes have been developed to provide individualized instructions on the 42 geographical concepts presented on the APH landforms. Starring a self-activating computer named "Doobie," the tapes define the concepts in a variety of ways and lead the students in exploration of the landform on which they appear. These tapes were written and recorded under the direction of Dr. Jack Miller of George Peabody College. Carson Nolan and Frank Franks coordinated the project.

## 2. Maps in the classroom (SOVI)

The objective of this project was the development of an instructional program designed to teach young blind students that a known environment can be represented abstractly on a simple map. The program consists of 80 lessons in two parts (40 lessons each), with tangible aids (e.g., symbols of chairs and tables, simple maps), and progresses from manipulation of concrete objects in a known environment to discrimination and manipulation of abstract symbols on simple maps. Part 1 of the instructional program is designed for use with blind students with a functional age of 3 years. The lessons teach 20 basic locational and directional referents (e.g., middle, between; near, far; right, left) using chairs and tables within the classroom. The 40 lessons are divided into four sections of 10 lessons each with two concepts presented in each lesson. The pairs of concepts are repeated in different contexts in succeeding lessons. In Part 2 the lessons apply the concepts and relationships



from Part 1 to operations involving symbols and their use on simple maps. The student performs location, placement, and movement operations in a defined workspace (a 6-8-foot square room) using concrete objects (tables and chairs), progresses to large symbols for the concrete objects, and eventually symbolizes the environment of a defined workspace with small symbols on a workspace sheet (a 10-inch square "map"). In final operations the student uses a simple map to locate or place objects in the defined workspace.

Six residential and public school educators (and additional participating teachers) worked with more than 100 blind students in the development/reviewing/editing of the instructional program. Totally blind students as young as 6 years of age were able to "read" a simple map after completing the 80 lessons. Frank Franks and Chris Kephart conducted and coordinated the development phase of this research.

### 3. Simplified continental relief maps (SOVI)

Despite persistent difficulties in the development of suitable molds for preparation of polyurethane maps, this project was finally brought to a conclusion. Early unsuccessful efforts resulted in the destruction of a number of map models which had to be reconstructed. The major difficulty in completing the project, however, was that the polyurethane stuck to the mold and was partially destroyed in the heat curing process. Additional changes in mold construction were made to insure more consistent tactual map surfaces, particularly with the water areas and with small islands. Models of simplified maps of Africa, Asia, and Australia were completed and sent to the contractor for production. Frank Franks and Larry Butterfield were responsible for development of the maps while Howard Oliver provided the solution to the mold problem.

## Development Planned for FY 1976

### 1. Maps in the Classroom (SOVI)

The instructional program previously described constitutes a 3-year program for preprimary level students with a functional age of 3 to 5 years. The program utilizes a diagnostic/prescriptive approach to instruction which enables the teacher to diagnose the student's progress level at any time and to prescribe lessons and activities to meet specific needs of individual students. The program can be used with older students and with blind students who have additional handicapping conditions.

Six educators participating in the development phase of the project reported that they had involved more than 100 students and several additional teachers in revising/adapting the instructional program. A final draft of the program that incorporates changes recommended during the development phase has been completed. The principle objective of this phase of the project is the final evaluation of the instructional program. The evaluation will consist of a critique-in-use by four to six teacher/evaluators in residential and public schools who did not participate in the development phase of the project. The teacher/evaluators will use the program and accompanying materials with young blind students, will review the overall program, and will prepare a report with

recommendations for any final changes to be made in the program. Frank Franks and Chris Kephart will complete this research.

## 2. Outline maps for large type readers (SOVI)

The first edition of outline maps has proved useful. However, some errors and ambiguities have been detected in these maps. Additional maps have been requested. Consequently, a new series of maps will be created by Larry Butterfield, whose background is in geography and cartography. This series will include a United States map, six regional maps, and maps of the individual states.

The maps will be desk-top size (20 X 14 inches to 20 X 16 inches) and will be designed to be printed in black ink on a buff, antique-finish paper. External outlines will be quite bold with interior divisions less bold. Longitude and latitude lines will be indicated on the borders of each map but will not dissect map. A linear scale in miles will be included on each map.

## D. Science Materials Development

### Development during FY 1975

#### 1. Individualized science experiments for the visually impaired (APH)

Six teachers in five residential and public school programs evaluated eight individualized science experiments. These eight experiments were selected from 20 developed by Lawrence Hall of Science, University of California (Berkeley). Teacher evaluations revealed a number of problems for young students: too difficult vocabulary; directions too complicated; inappropriate, too many, or not enough variables to allow students to draw valid conclusions. The foregoing problems inhibited individual work which the experiments were designed to promote.

The experiments were edited or rewritten restricting each experiment to a single concept. Variables were defined and identified for clarification where appropriate. Vocabulary and directions were simplified. The format was adapted to allow students to draw valid conclusions from each experiment. The primary use of specialized equipment was included in preliminary experiments. Eight experiments are now ready for production and distribution. Frank Franks was project leader. Mrs. LaRhea Sanford, elementary science teacher, Florida School for the Blind, edited the experiments.

#### 2. Revision of the manual for APH Light Sensor (APH)

Two years ago, the Educational Aids Committee approved production of a version of the light probe distributed by the Royal National Institute for the Blind. A set of experiments were identified and tested for use with this device. Subsequently, APH, in cooperation with the Lawrence Hall of Science, Berkeley, California, developed a version renamed the Light Sensor which is currently in production. For use with this newer device, a set of 20 simple exemplary experiments has been described which will be published in manual form to accompany the Light Sensor. Frank

Franks was assisted by LaRhea Sanford of the Florida School in developing this manual.

### Development Plans for FY 1976

#### 1. Light experiments for the blind (SOVI)

Severely visually impaired students have great difficulty in understanding light phenomena. Availability of the APH Light Sensor enables these students to deal with light variables directly. Phenomena such as light intensity, reflectance, transparency, opacity, and shadows can be demonstrated. This year it is planned to develop 4-8 individualized kits of experiments for elementary level children. Frank Franks will supervise this activity.

#### E. Mathematics Materials Development

### Development Plans for FY 1976

#### 1. Metric measurement tools and materials (SOVI)

Although the APH has met some needs for metric measures expressed by expert teachers, a systematic materials development program in metrics for blind students has not been initiated. This project proposes to initiate a research and development program in metric measurement materials utilizing the input of expert mathematics and science teachers of blind students, of mathematics specialists, and of appropriate APH staff. The subordinate objectives are:

1. to identify concepts which are critical to instruction of metric measurement to blind students.
2. to locate and review educational aids (for teaching the concepts) which can be used in their present form and educational aids which require adaptation.
3. to specify those aids which require development.
4. to make mock-ups and prototype models of metric aids which appear suitable (with adaptation) for use by blind students.

Expert teachers and appropriate APH staff will review metric concept areas, identify critical concepts in each area, conduct a materials search for commercially available metric aids, and compile lists of metric aids which appear to have implications for use by blind students. Mock-ups and prototype models of educational aids for demonstrating measurement operations will be made or adapted. Frank Franks and Chris Kephart are initiating this research program. Mrs. LaRhea Sanford (science) and Mr. Tuck Tinsley III (math) of the Florida School are participating in this phase of study.

#### F. Materials for Development of Auditory and Oral Language Skills

### Work Compiled during FY 1975

#### 1. Adaptation of the "Listen and Think" materials (SOVI)



Levels H and I of Educational Developmental Laboratories "Listen and Think" taped lessons were adapted, field tested, and revised. One hundred one students completed a trial use of one of the two programs and eight teachers submitted recommendations for revisions. Four schools were involved in the field tests. Fay Leach was assisted by Eleanor Pester, Debbie Hill, and Marvin Murr in this project.

## 2. Materials for very young children or multihandicapped (SOVI)

A prototype unit of materials was developed for children functioning on the following levels:

- Level I - Children who receive sound but do not recognize it.
- Level II - Children who have receptive language but little expressive language.
- Level III - Children who have expressive and receptive language with few concepts.

The basic materials for Levels I-III, Basic Approach to Beginning Language (BABL), consist of: (a) 3 illustrated parent/teacher guidebooks; (b) 6 taped adult demonstrations; (c) 129 activity cards; (d) 20 taped children's selections; (e) 5 book cards; (f) a program purpose and description; and (g) 3 developmental checklists.

The formative evaluation of the BABL program consisted of a 3-month field test by 16 teachers of visually handicapped children and an in-depth review by a specialist in child development. During the field test, the materials were used by visually handicapped children and their parents. Other professionals and paraprofessionals assisted in the test and review. Project personnel visited each site involved and discussed the materials and evaluation forms in detail with all persons participating. A report on this formative evaluation was written.

Initial prototypes were begun for children who have receptive and expressive language but are still functioning at less than first grade level (Level IV-The Auditory Language Kit). Permissions have been obtained to adapt portions of three commercially available preschool language programs. These materials were selected as a part of a survey of preschool language programs.

On July 9-11, 1975, the Auditory and Oral Language Project Committee met to review the project progress, the report of the BABL formative evaluation, to make recommendations as to ways to revise the program, and to give suggestions for materials at Level IV (TALK).

Information on available materials from 113 companies was reviewed as part of this project. In addition, a visit was made to Walt Disney Productions. Local consultants assisted in decisions concerning recording/editing techniques and equipment purchases in order to produce the tapes. Fay Leach and Hilda Caton were assisted by Eleanor Pester, Debbie Hill, and Marvin Murr in this project.

over to the APH's Editorial Department.

### 3. The Durrell Listening-Reading Series, Forms DE and EF (SOVI)

This test series provides a comparison of students' listening and reading abilities in order to identify those pupils who are in need of special help, and those who can profit by an enriched program. The series consists of a Reading Test, which measures reading achievement, and a parallel Listening Test, presented orally, which measures understanding of the spoken word. There are three levels in the series which encompass grades 1-9. The two forms of the test for all three levels were edited for braille and large type publication after which five sets of supplemental directions for administering the braille and large-type editions of the series were prepared. All test materials have been submitted to the APH's Editorial Department. These materials were prepared by June Morris.

Prior to adaptation of the Primary Level of the series, it was necessary to conduct a study to determine if visually handicapped children at the grade levels for which the level was designed (1-3) would be able to use the test. Normally, tests of the paper and pencil type have not been published for use by visually handicapped children below grade 2.5. A total of 141 students from grades 1-3 were tested with a shortened version of one form of the Primary Level. Results indicated that second and third grade students had no problems using the test and that 66% and 77% of braille and large type students, respectively, at the first grade level were able to use it. Consequently, there appears to be enough potential users to warrant publication of the Primary Level of the Durrell Listening-Reading Series in both braille and large type.

June Morris was responsible for the evaluation of the Primary Level of the series. She was assisted by Debbie Hill.

### 4. The Boehm Test of Basic Concepts, Form A (SOVI)

A tactile analog of the Boehm Test of Basic Concepts, Form A (BTBC), was developed and evaluated, and a manual for administering the test was written during fiscal 1975. This tactile analog is entitled the Tactile Test of Basic Concepts (TTBC). It consists of 50 plastic cards on which the 50 items of the BTBC are presented in the form of raised, outline drawings. These drawings represent the same concepts as those presented in the BTBC and are arranged in the same order.

A formal field test was made of the TTBC. Subjects were 75 students in grades K-2 in six residential and six public school programs for the visually handicapped. Results of the formal field evaluation provided performance data in the form of order of item difficulty and percentage passing scores by grade level for the TTBC. In addition, categories of item difficulty were developed to assist in the interpretation of scores. The reliability of the TTBC, as estimated by the Kuder-Richardson reliability coefficient, was .87, indicating a relatively strong internal consistency for the test. The concurrent validity of the TTBC was determined by a comparison of the performance of blind subjects on the TTBC

## Plans for FY 1976

### 1. "Listen and Think" adaptation (SOVI)

Level AR of the "Listen and Think" program will be developed and evaluated following much the same procedure as was followed for the eight previously adapted levels (B-I). Level AR, because of its pictorial nature and the level of students for whom it is designed, requires a modified format and a new answer sheet. The adaptation of this level will mean that the entire program developed by Educational Developmental Laboratories will be available through APH in its adapted format. Fay Leach and Eleanor Pester will do this adaptation.

### 2. Auditory and oral language skills development (SOVI)

Revision of the BABL (Levels I-II) program is to be made on the basis of the formative evaluation and recommendations from the project review committee meeting. The materials are then to be submitted for review by four experts in the area of early language development and/or visually handicapped children.

Development of the TALK (Level IV) materials is to continue and this program is to be submitted for formative review by three experts in language development and/or visually handicapped children. Fay Leach will be assisted by Eleanor Pester and Margie MacDougall in this project.

## G. Adaptation of Educational Measures

### Educational Materials Development during FY 1975

#### 1. The Wide Range Achievement Test (BEH)

The Wide Range Achievement Test is an individual test for clinical use indicating level of skill in oral reading, spelling, and arithmetic computation. It can be used in remedial and vocational studies with both children and adults having a range from kindergarten through college.

The test was recommended for adaptation for use by the blind by a test advisory group that met at the APH in 1973 to assist in determining test needs and priorities for use with blind students. The test materials were edited and prepared for braille and large type publication and administration by June Morris and were submitted to the APH's Editorial Department.

#### 2. The Wide Range Vocabulary Test, Forms B and C (BEH)

The Wide Range Vocabulary Test is a 100-item, multiple-choice test that can be used to obtain a quick estimate of verbal or scholastic intelligence for literate individuals. It is steeply graded in difficulty to cover the range from third grade through college. The two forms of the test are equivalent.

As with the Wide Range Achievement Test, this test was recommended for adaptation for use with the blind by the test advisory group. Both forms of the test have been edited and prepared for braille and large type publication by June Morris. Needed adaptations were also made to the directions for administering. All test materials have been turned



with the performance of seeing subjects on the BTBC. The assumption was made that, if the performances of the two groups were not significantly different, the same purpose was accomplished by the two tests and concurrent validity could be claimed for the TTBC. Results of these analysis did, in fact, reveal no significant differences between the two groups on the basis of vision. As a result, concurrent validity was assumed for the TTBC. Both the BTBC and the TTBC were considered to be content valid since the items on both tests are identical and are taken directly from curricular materials used by both blind and seeing children. Hilda Caton was responsible for this project.

#### Plans for FY 1976

##### 1. Adaptation of an oral reading test (APH)

Unfortunately, under our new SOVI contract, we are prohibited from adapting additional educational measures. However, one test remained from a list of needs previously defined. This is an oral reading test for the elementary grades. Plans have been made to survey available print tests, select one for adaptation, and edit it for braille and large type publication during next spring and summer. Field trials will be made as required. This work will be supervised by June Morris.

#### H. Materials for Multihandicapped, Visually Impaired (MVI) Students

##### Work during FY 1975

##### 1. Meeting on materials needs (APH)

Ten consultants representing various types of programs serving MVI children as well as representing different geographical areas of the United States met at APH, March 20-22, 1975. The participants defined general areas of materials needs of MVI children and identified specific materials that are needed in each area. The areas and specific materials were ranked according to priorities. Ranking of areas from greatest need to least need was as follows: (1) communication, (2) sensory development, (3) motor skills, (4) self-concept formation, (5) self-help skills, and (6) daily living skills. It was recommended that the focus of materials adaptation and development begin with sensory development in so far as another project emphasizes basic auditory and oral language skills. Specifications were drafted for the materials. Of all the materials identified, a sensory experience kit was considered the most urgently needed. Carson Nolan and Fay Leach were assisted by Eleanor Pester and Chris Kephart in the workshop arrangements.

##### Work Planned for FY 1976

##### 1. Basic sensory experience kit (SOVI)

Ten consultants met at the APH to identify materials needs for MVI students. A sensory development kit was suggested as a material greatly needed for these children. The purpose of this kit would be to provide teachers with materials to foster a wide range of basic experiences in the five sensory modalities: visual, auditory, olfactory, gustatory,

and tactual. The project focus for fiscal year 1976 will be to define the basic sensory experiences of significance, to develop the specifications for the kit, and to assemble and adapt materials which might be incorporated into the kit. Fay Leach and Chris Kephart will be assisted by Margie MacDougall.

## I. Primary Braille Reading Series (BEH)

### Work Planned during FY 1976

This is a new project funded under a 3-year grant from BEH.

The purpose of this project is to develop a set of beginning reading materials specifically designed to minimize problems encountered by the beginning reader of braille. Specifically, the work on this project for fiscal year 1976 will include the writing of detailed coordinated specifications for braille readers, braille workbook materials, and teacher's manuals using all relevant information from research on braille reading and print reading; and the development of vocabulary lists derived from analyzing standard word lists containing vocabulary used at the primary level in most educational programs. The process for the development of specifications will consist of four phases: (a) identification of relevant factors from the areas of research on reading braille, general tactual perception, development of concepts by the blind, and general practices in teaching reading; (b) integration of these into overall specifications for the braille reading series; (c) review of the specifications by a committee of experts; and (d) revision of the specifications based on the expert review. The process for the development of vocabulary lists initially will be to categorize and list those fully spelled out words in the braille code followed by those words which are contracted or abbreviated. Subsequently, these words will be categorized and listed according to such attributes as length, kind of contractions, difficulty of contractions, etc. These lists will then be used to identify vocabulary for the stories as they are written.

The entire beginning braille series will consist of children's readers from preprimer to third grade, workbooks to accompany the readers, and teachers manuals. Following the development phase, a field trial phase is planned. Hilda Caton and Eleanor Pester are responsible for this project.

## J. Other Research and Development

### Work during FY 1975

#### 1. Abacus instruction (APH)

The purpose of this project was to develop an instructional module for training teachers in use of the abacus. The module consists of audio cassettes and a workbook. Addition, subtraction, division, and multiplication are covered. An initial set of tapes was made and reviewed by experts. Suggestions for revisions were made and a second set of tapes prepared. A workbook to accompany the recorded materials

was drafted and subjected to internal APH review. Upon revision, both the workbook and second set of tapes were reviewed by one expert mathematics teacher. Final revisions based on this review remain to be completed. Carson Nolan coordinated this project.

### Work Planned for FY 1976

#### 1. Basic reference materials for the partially sighted (SOVI)

According to the most recently published figures, 45% of pupils in the United States who are legally blind use large type or a combination of large type and regular print. A continuing problem for these pupils is their lack of access to information commonly presented in tabular form (e.g., weights and measures, mathematics tables, population figures, etc.). These are normally presented in tiny print on pages having narrow margins; a combination making them inaccessible to the partially sighted even with the benefit of magnification devices.

The primary objective of this project is to develop basic reference materials in a format suitable for use by the partially sighted. Initially, three steps will be taken in meeting this objective. Basic reference materials that are normally presented in tabular form will be identified; priorities, in terms of educational usefulness, will be determined for the various basic reference materials identified; and appropriate formats for use by the partially sighted will be designed for those basic reference materials for which there is the greatest need.

June Morris will be assisted by Debbie Hill with this project.

#### 2. Adaptation of self-instructional systems for the visually handicapped (SOVI)

This project will address itself to a thorough and systematic review of simple self-instructional systems designed for seeing students and to the selection and adaptation of the system considered to be most appropriate for use by visually handicapped students. In general, the instructional systems to be considered will be those consisting of an electrically or battery operated teaching machine which provides auditory and/or visual feedback to students and which are accompanied by a series of sequenced learning programs in various subject areas. The systems will be those which can be used independently by students. Work on this project during fiscal year 1976 will focus on the adaptation of the teaching machine contained in the system selected and the adaptation of a number of the learning programs accompanying the machine. The materials will also be prepared for a formal field evaluation. Hilda Caton is project director.

### AGENCIES PARTICIPATING IN RESEARCH DURING THE YEAR

Special thanks are due to the schools and other organizations whose facilities and students participated in the research and development effort. Residential schools for the blind include Alabama, Arkansas, California, Colorado, Florida, Georgia, Governor Morehead, Indiana, Kansas, Kentucky, Lavelle, Louisiana, Maryland, Michigan, Mississippi, Missouri, New York State, Ohio, Overbrook, South Carolina, Tennessee, Texas,



W. Ross MacDonald, Western Pennsylvania, and Wisconsin. Public schools participating were Phoenix, Arizona; Berkeley and San Mateo, California; Dade, Duval, Hillsborough, Orange, and Pinellas Counties in Florida; DeKalb County, Georgia; and public schools in Virginia under the aegis of the Virginia Commission for the Blind. A number of other organizations participated including the Foundation for Blind Children, Scottsdale, Arizona; Foundation for the Junior Blind, Los Angeles; Variety Club Blind Babies Foundation, San Francisco; Starr King Exceptional School, Carmichael, California; West Suburban Association for the Hearing, Orthopedically and Visually Impaired, Lombard, Illinois; Southern Baptist Theological Seminary Day Care Center, Louisville; Boston Center for Blind Children, Boston; Early Education Center and Watkins Center for the Handicapped, Jackson, Mississippi; and Ellisville State School, Ellisville, Mississippi.

## RESEARCH AND DEVELOPMENT PERSONNEL FOR FY 1975

Berla', Edward, PhD - Behavioral Research Scientist

Butterfield, Larry, MA - Educational Research Assistant

Caton, Hilda, Ed. Spec. - Educational Research Scientist

Coy, Ken - Educational Materials Technician

Franks, Frank, EdD - Educational Research Scientist

Hill, Deborah, BA - Educational Research Assistant

Kephart, Christine, MEd - Educational Research Associate (part time)

Leach, Fay, EdD - Educational Research Scientist

Morris, June, MA - Behavioral Research Scientist

Murr, Marvin, BA - Educational Research Assistant

Nolan, Carson, PhD - Coordinator; Educational Research, Development,  
and Reference Group

Pester, Eleanor, MS - Educational Research Associate

Powell, Enola - Secretary

Wingfeld, Debra - Secretary

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- Berla', E. P., & Murr, M. J. The effects of tactual noise on locating point symbols and tracking a line on a tactile pseudomap. Journal of Special Education, 1975, 9, 183-190.
- Berla', E. P., & Murr, M. J. Psychophysical functions for active tactual discrimination of line width by blind children. Perception & Psychophysics, 1975, 17, 607-612.
- Caton, H. R. The development and evaluation of a tactile analog to the Boehm Test of Basic Concepts. Doctoral dissertation, University of Kentucky, 1975.
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- Kurzahls, I. W., & Caton, H. R. A tactual road to reading. Louisville, Ky.: American Printing House for the Blind, 1975.
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Nolan, C. Y., & Morris, J. E. Program for facilitating the education of the visually handicapped through research in communications: The American Printing House Aural Study System as a reference source: Interim progress report no. 1 (Project No. 23 3492; Grant No. OEG-0-73-0642). Louisville, Ky.: American Printing House for the Blind, 1974.



## CONSULTANTS DURING FY 1975

### Consultants in Auditory and Oral Language Development

- Mrs. Virginia Alexander, Director of Education, Upsal Day School for Blind Children, Philadelphia, Pennsylvania
- Dr. Lisa Barclay, Child Development Specialist, University of Kentucky, Lexington, Kentucky
- Dr. Verna Hart, Coordinator, Early Childhood Education for the Handicapped, University of Pittsburgh, Pittsburgh, Pennsylvania
- Ms. Linda Kates, Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Mrs. Kay Loss, Language Program, Arkansas School for the Blind, Little Rock, Arkansas
- Miss Donna Martin, Director, Southern Baptist Theological Seminary Day Care Center, Louisville, Kentucky
- Mrs. Carol Wray, Parent-Infant Educator, West Suburban Association, Lombard, Illinois
- Family Communications, Inc. (Mr. Roger's Neighborhood) Pittsburgh, Pennsylvania
- Walt Disney Productions, Inc., Los Angeles, California

### Consultants in Educational Measurement

- Mr. Don Adamshick, Psychologist, Ohio State School for the Blind, Columbus, Ohio
- Mrs. Sarah Ashman, Certified Psychologist, Indiana School for the Blind, Indianapolis, Indiana

### Consultants in Multihandicapped Visually Impaired Child

- Mrs. Virginia Alexander, Director of Education, Upsal Day School for Blind Children, Philadelphia, Pennsylvania
- Dr. Jenny R. Armstrong, Coordinator, Special Office Three, The Wisconsin Research and Development Center for Cognitive Learning, The University of Wisconsin, Madison, Wisconsin
- Ms. Cleopatra Bullock, Unit for Blind Multihandicapped, Murdoch Center, Butner, North Carolina

Dr. Rebecca Dubose, Program for the Multihandicapped, Department of Special Education, George Peabody College, Nashville, Tennessee

Mr. Bill J. Duckworth, Consultant, Programs for the Physically and Visually Handicapped, Indiana State Department of Public Instruction, Indianapolis, Indiana

Ms. Carmella Ficociello, Educational Consultant, South Central Regional Center for Services to Deaf-Blind Children, Dallas, Texas

Miss Toni Skinner, Teacher of Multihandicapped, California School for the Blind, Berkeley, California

Ms. Jill Stoefer, The University of Nebraska-Lincoln, Teachers College-Department of Educational Administration, Specialized Office for the Deaf, Lincoln, Nebraska

Mr. John Venn, Teacher, Love Grove Elementary School, Jacksonville, Florida

Ms. Ruth E. Zimmerman, Preschool Teacher-Consultant, Boston Center for Blind Children, Boston, Massachusetts

#### Consultants in Science

Mrs. Irene Casey, Program for the Blind, South Carolina School for the Deaf and the Blind, Spartanburg, South Carolina

Mr. John Fant, Itinerant Teacher, The Robert Shaw Center, DeKalb County School System, Scottdale, Georgia

Miss Kathy Freeland, Elementary Science Teacher, Kentucky School for the Blind, Louisville, Kentucky

Lawrence Hall of Science, University of California (Berkeley), Berkeley, California

Mrs. Myrtle Oliver, Elementary Educational Supervisor, Georgia Academy for the Blind, Macon, Georgia

Mrs. Virginia Robinette, Program for the Blind, South Carolina School for the Deaf and the Blind, Spartanburg, South Carolina

Mrs. Teny Sanford, Elementary Science Teacher, Florida School for the Blind, St. Augustine, Florida

#### Consultants in Social Studies

Mrs. Pat Carpenter, Consultant, Visually Impaired and Multihandicapped Program, DeKalb County School System, Scottdale, Georgia

Mrs. Mary Nell Council, Social Studies Teacher, Tennessee School for the Blind, Nashville, Tennessee

- Mrs. Rebecca Crowell, Kindergarten Teacher, Tennessee School for the Blind, Nashville, Tennessee
- Mrs. Margaret A. Davis, Elementary Teacher, South Carolina School for the Deaf and the Blind, Spartanburg, South Carolina
- Mrs. Mildred Howard, Kindergarten Teacher, Georgia Academy for the Blind, Macon, Georgia
- Mrs. Louella McDowell, Elementary Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Mr. Dan Miller, Orientation and Mobility Specialist, Virginia Commission for the Visually Handicapped, Richmond, Virginia
- Dr. Dennis Spetz, Associate Professor, Department of Geography, University of Louisville, Louisville, Kentucky
- Dr. Louis Seig, Professor and Chairman, Department of Geography, University of Louisville, Louisville, Kentucky
- Mr. Gerald Vandergrift, Elementary Supervisor, Florida School for the Blind, St. Augustine, Florida
- Mr. William J. Woods, Social Studies Teacher, Tennessee School for the Blind, Nashville, Tennessee

#### Consultant in Statistics

- Dr. Irwin Nahinsky, Assistant Professor, Psychology Department, University of Louisville, Louisville, Kentucky

#### Development Group for Landform Tapes

- Mr. Gary Christy, Teacher, Nashville Public Schools, Nashville, Tennessee
- Mrs. Mary Nell Council, Teacher, Tennessee School for the Blind, Nashville, Tennessee
- Mrs. Edith Georgi, Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Dr. Jack Miller, Professor, George Peabody College for Teachers, Nashville, Tennessee
- Dr. Willard Smith, Assistant Professor, University of Tennessee (Nashville), Nashville, Tennessee
- Dr. Gilbert Trythall, Professor of Music, George Peabody College for Teachers, Nashville, Tennessee











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Pamphlet File

Professional Development

IMPROVING

## Department of Educational Research

## Report on Research and

## Development Activities - Fiscal 1976

Research and development in the areas of listening, braille reading, social studies, science, language development, and educational measurement continued at a steady pace during FY 1976. We continued to receive support for our efforts from the Bureau for Education of the Handicapped (BEH), U.S. Office of Education (USOE). Principal support was through our contract for the Special Office for the Visually Impaired (SOVI) which is part of a nationwide materials support network sponsored by BEH. Our colleagues in the field rendered their usual high level of cooperation, either through direct participation in our projects or through allowing access to their students. Co-workers at the Printing House continued to facilitate our program in many meaningful ways.

## PROGRESS IN SPECIFIC RESEARCH ACTIVITIES

What follows is a listing of our various research tasks with summaries of the progress made in each project. The project leader responsible and assistants are identified at the end of each project description. As always, Ken Coy, our educational materials development technician, made substantial contributions to many of our projects. The source of financial support for the projects will be indicated at the end of the title for each. (APH) will indicate Printing House support, (SOVI) will indicate support from this contract, and (BEH) will indicate support from other BEH-USOE grants.

### A. Facilitating Listening as a Medium for Education of the Visually Impaired

The use of listening as an educational medium has been an area in which APH has had an ongoing interest for many years and for which it has maintained a continuing research program. Currently, the emphasis of this program has been on the adaptation and/or design of materials and on techniques to enhance the use of listening as a study skill.

## Research Conducted during FY 1976

### 1. Evaluation of an indexing cassette system as a reference source (BEH)

An indexing cassette reference system was developed which consists of an indexing cassette player, specially prepared cassettes, and written indexes. The system is designed so that the user can locate exactly any topic on a tape by setting the index number associated with that topic into the controls provided on the player. This system was subjected to a field trial in which 24 legally blind subjects from grades 7-12 were taught to use it and then tested on their skill at locating entries in a recorded sample from an encyclopedia. Subjects using braille and large type, respectively, were able to locate 87% and 85% of the entries correctly. For those located correctly, the average per item times were 76 seconds and 72 seconds for subjects using braille and large type, respectively. Subjects were able to locate and operate various features of the indexing cassette player, an integral component of the cassette reference system, with 94% accuracy. However, the reliability of the players' indexing capability was only 88% which was below the criterion of 98% set for this function. In summary, results indicated that blind students could use the cassette reference system with an acceptable degree of accuracy and within appropriate time constraints, but that the indexing cassette player required further refinement to improve reliability of its indexing capability.

Since this evaluation was made, the players have been slightly modified to improve reliability. Limited testing indicates reliability will now meet criterion.

The cassette indexing system was designed and developed by Bob Phelps of the Talking Book Department. Working closely with him in preparation of the tapes was Jim Kerns. June Morris, assisted by Debbie Hill, was responsible for the evaluation of the system.

### 2. Design of written indexes for use with recorded encyclopedia (BEH)

The format and content of written indexes to accompany recorded reference materials should provide for maximum efficiency of use. In an attempt to determine specifications for such, six different written indexes for a recorded encyclopedia sample were designed and tested with 48 legally blind students from grades 7-12. The indexes varied through two styles and three lengths, or amounts of information (100%, 75%, and 50% of encyclopedia entries listed). Results indicated no overall difference in usage between the two styles and that the indexes containing 100% and 75% of the entries could be used with similar speed and accuracy. Both of these could be used significantly faster and more accurately than the indexes containing only 50% of the entries. June Morris was responsible for this study. She was assisted by Larry Butterfield, Debbie Hill, and Margie MacDougall.

### 3. Media comparison study of dictionary use (BEH)

The purposes of this study were to determine the feasibility of use of recorded dictionary materials for intermediate level visually handicapped students and to compare use of written and recorded dictionary materials by these students in terms of accuracy and time. Written materials were in braille and large type. Dictionary materials were recorded on audio cassettes and vocally indexed with the vocal indexing being on the same track as the content, but only heard in the fast forward mode. Subjects included 16 legally blind students from grades 6 and 7. After training in use of the recorded materials, subjects were able to locate 88% of the test items in the recorded material in an average time of 136 seconds per item. This compared with 96% accuracy and an average per item time of 45 seconds when using the more familiar written materials. Although these differences favor use of the written materials, results indicate it is feasible for visually handicapped intermediate level students to use recorded materials of this type. June Morris was assisted by Debbie Hill and Margie MacDougall in this study. The special tapes were prepared by Jim Kerns of the Talking Book Department.

### 4. A consumer review of a cassette dictionary (BEH)

The purposes of this study were to determine interest of potential consumers in having a recorded dictionary and in obtaining their opinions regarding the best format for such a dictionary. Subjects included 10 mature blind consumers, 10 teachers of high school level blind students (some of whom were blind themselves), and 10 librarians at residential schools for the blind. Two experimental recordings containing a 1-hour selection from an adult dictionary were used to familiarize subjects with dictionary material in recorded form and to demonstrate two possible formats. Subjects were able to use both formats but preferred (73% to 20%) the one having index information superimposed at a higher speed on same the tracks with the content over the one having index information on the tracks running parallel to the content tracks. Eighty percent of the subjects stated they would prefer to use a written dictionary than a recorded one. June Morris held primary responsibility for this study. She was ably assisted by Debbie Hill. The special cassettes were prepared by Jim Kerns.

## B. Social Studies Materials Development

Development during FY 1976

### 1. Maps in the classroom (SOVI)

This instructional program provides a variety of conceptual experiences fundamental to the acquisition of basic map reading skills by young blind students in the functional age range of 3 to 5 years. The ultimate goal of the program is for these students to develop a map concept and to relate themselves specifically to a defined workspace utilizing simple maps and symbols. A developmental sequence was followed to introduce essential concepts (e.g., far, near; left, right) in a logical and orderly manner. A preliminary



screening instrument is included which can be used to diagnose the student's knowledge of concept relationships. Part 1 of the instructional program is readiness-oriented and focuses on the blind student's relationship to objects in his immediate environment. Part 2 focuses on the relationship of concrete objects to the space in which they are located. The program introduces concrete objects (e.g., chairs, tables) in a defined workspace--a 6 to 8 foot square "room" within the classroom--and proceeds to the use of symbols on simple maps representing the workspace room.

The program was evaluated by six teachers in public and residential schools across the country with 28 young visually impaired students between 3 and 6 years of age. All students completed Part 1 and more than half completed Part 2 during the school year. Teacher response was enthusiastic. The young students who completed the program not only were able to manipulate the symbols but were able to identify the objects they symbolized as they performed tasks using maps. Frank Franks and Chris Cozen completed this project.

## 2. Outline maps for large type readers (SOVI)

A series of 57 large type outline desk maps of the United States were developed to provide base maps for low vision students similar to commercially produced base maps used by sighted students. The series includes a map of the United States, six regional maps of the United States, and one each of the 50 states of the United States. All the maps are 18 X 13 inches and will be printed in black ink on regular buff-antique paper.

Latitude and longitude lines (West of Greenwich) are shown on each map but they do not dissect the map. A 5 X 3 1/2 inch insert of the United States depicts the location of the region or state to the rest of the continental United States. Alaska and Hawaii do not have inserts. A bar scale is included on each map with distance indicated in miles. Larry Butterfield developed the masters for these maps.

## C. Science Materials Development

Development during FY 1976

### 1. Individualized light experiments (SOVI)

Last year it was reported that APH has produced a light sensor which affords blind students opportunities for direct observation and experimentation with light. The sensor produces an auditory signal of varying pitch and volume as a result of its exposure to intensity of light. By focusing the light sensor on apparatus used in many basic science experiments, a student is able to receive immediate auditory feedback.

This year a number of experiments using the light sensor have been designed. An individualized, hands-on approach has been followed in the development of these sophisticated experiments for students at the upper elementary and high school level. Students can work independently in performing the experiments. The experiments in the following categories were

developed in rudimentary form and received pilot trials: (1) transparency, of materials, (2) light reflection, (3) polarization of light, and (4) how light travels. Challenges which require additional experiments and afford capable students opportunities for discovery and further application of the initial concepts were drafted.

Frank Franks supervised this research.

#### Work Planned for FY 1977

##### 1. Individualized light experiments (SOVI)

The four light experiment units will be evaluated and will be revised as indicated from the field evaluation. Field evaluation of the individualized experiments will consist of a critique-in-use by teachers who use the materials and aids with legally blind elementary grade students (grades 4-8).

The experiments to be evaluated are summarized below:

Experiment I: Light reflectance. The objective of this experiment is to sensitize blind students to the variations in sound made by the light sensor when different amounts of light are reflected into the eye of the sensor.

Experiment II: Transparency of materials. The objective of this experiment is to introduce the concepts of transparency, translucency, and opacity of materials.

Experiment III: How light travels. The objective of this experiment is to demonstrate that light travels in straight paths.

Experiment IV: Light can be polarized. The objective of this experiment is to demonstrate that light rays can be "polarized" or screened.

Frank Franks is project leader and will be assisted by Debbie Hill.

#### D. Mathematics Materials Development

##### Development during FY 1976

##### 1. Metric measurement tools and materials (SOVI)

The purpose of this project is to develop metric measurement readiness materials and appropriate tools. During the year, relevant literature on metric instruction was reviewed. The project staff met with a number of mathematics and science teachers to determine metric needs of blind students. Inspections of elementary mathematics and science textbooks were made to determine the kinds of activities appearing which are relevant to metric measurement instruction.

More than 50 commercial catalogues were searched for available metrics measurements materials that might be usable with visually impaired students. The metric materials identified were obtained and reviewed for adequacy by APH staff and outside consultants.

Based on this information, plans for an overall metric measurement program were sketched. Specific plans for linear measurement were defined. Frank Franks and Karen Goldstein were APH personnel on this project.

#### Development Plans for FY 1977

##### 1. Metric measurement tools and materials (SOVI)

Instructional materials for teaching linear measurement, mass, volume, and area will be adapted or developed. The overall project consists of two components: (1) development of readiness materials for teaching metric measurement, and (2) adaptation or development of general measurement aids. Readiness instructional materials and specialized aids will introduce pre-number measurement processes and will provide number measurement activities which are an extension of the prenumber operations. This instruction will then be extended to number measurement. General measurement aids which are commercially available will be adapted for use with existing instructional programs and textbooks. Where such aids are not available, new aids will be developed.

During Fiscal 1977 the linear measurement readiness component and linear aids will be developed and will be pilot tested at the Florida School for the Blind. Frank Franks, the project leader, will be assisted by Sharon Goldblatt and Karen Goldstein.

##### 2. Two-and three-dimensional relationships in mathematics (SOVI)

The primary objective of this project is the development of a tactile mathematical aid for illustrating a broad range of two-and three-dimensional spatial concepts to blind students (K-12) utilizing a hands-on approach. The subordinate objectives are to:

- a. Review the mathematics curriculum through textbook inspection to identify representative spatial concepts in mathematics which blind students can not presently comprehend because of the highly visual and abstract nature of the concepts.
- b. Develop an aid prototype which can be used to illustrate two- and three-dimensional mathematical concepts.
- c. Conduct preliminary field trials to determine if blind students can locate and manipulate the aid's operational parts.

Frank Franks is project leader and Debbie Hill is the APH research assistant on the project.



## E. Materials for Development of Auditory and Oral Language Skills

Work Completed during FY 1976

### 1. Adaptation of the "Listen and Think" materials (SOVI)

Level AR of the Educational Developmental Laboratories' "Listen and Think" program has been adapted for visually handicapped students in kindergarten through grade 3. Thirty visually handicapped students participated in a pilot study of the simplified multiple-choice answer sheet and 32 other legally blind students assisted in a pilot study of five of the adapted lessons. The complete set of AR lessons was used by seven teachers with 94 students in two different schools for the blind. These seven teachers reviewed the materials and made recommendations for revisions which were incorporated into the adapted materials. The adaptation of this level means that the entire "Listen and Think" program developed by Educational Developmental Laboratories is available through APH for use by visually handicapped students from kindergarten through grade 9. Eleanor Pester was assisted by Margaret MacDougall and Deborah Hill in this project.

### 2. Language materials for very young children or multihandicapped (SOVI)

Revisions were made in the Basic Approach to Beginning Language (BABL), Levels I-III materials with new materials being developed in light of the recommendations of the formative evaluation and review meeting (July 9-11, 1975). More than 40 new musical-sound effect children's selections were written and recorded. The six adult demonstration tapes were revised, submitted for expert review, and recorded. Revisions were made to the three guidebooks and activity cards.

A special studio was set up equipped to do the mixing of music and sound effects required in the recording of the materials in this project. The sound effects library was expanded. Three specialists assisted with the development of the master tapes. Children's sounds and voices were included as requested in the formative evaluation.

Margie MacDougall, Sharon Goldblatt, and Chris Cozen assisted Fay Leach in this project.

Work Planned for FY 1977

### 1. Language materials for very young children or multihandicapped (SOVI)

Revision of the BABL program is to be completed with the assistance of review experts. Included in this is to be an expansion of the teacher's handbook. This kit of materials is to be placed for independent evaluation and subsequent revisions are to be made.

Information from this development and review and the new equipment are to be used in developing materials for children at levels higher than the BABL materials. Sharon Bortner will be assisted by Margie MacDougall and Sharon Goldblatt in this project.

#### F. Adaptation of Educational Measures

##### Educational Materials Development during FY 1976

##### 1. Selection of a diagnostic oral reading test (APH)

The need for a diagnostic oral reading test was first documented by a test advisory group when it met at APH several years ago. During FY 1976 an attempt was made to identify a test of this type that would meet APH's criteria for test adaptation. Initially, catalogues of commercial test publishers were searched and possible tests ordered and reviewed. Then, persons from throughout the country (27 in all) with interest in and knowledge about tests, as used with visually handicapped, were queried to obtain information about tests of this type they had used or felt would be particularly suitable for adaptation. Additionally, persons attending a special interest group meeting of psychologists and evaluators on "Assessment and Test Need," held in conjunction with the 1976 meeting of the Association for Education of the Visually Handicapped, were asked for ideas. The net result of these efforts was that no test of this type appeared to exactly fit our needs; however, when all information was sifted, it became apparent that the Gilmore Oral Reading Test would be the most suitable for adaptation. June Morris was responsible for the selection of this test.

##### Plans for FY 1977

##### 1. Adaptation of the Gilmore Oral Reading Test (APH)

Providing permission can be obtained from the test publisher, Harcourt Brace Jovanovich, this test will be edited for braille and large type and its directions adapted, as necessary. June Morris will prepare the test materials.

#### G. Materials for Multihandicapped, Visually Impaired Students

##### Work during FY 1976

##### 1. Basic sensory experience kit (SOVI)

Relevant basic sensory experiences were defined and a set of specifications for the sensory stimulation kit were developed. The specifications were reviewed by an in-house committee and revisions made. Commercially available materials were searched. Materials were developed according to specifications. An initial kit was assembled from items which could be purchased, adapted, or had to be developed. This kit was pilot tested with five children at the

Child Evaluation Center, Louisville, Kentucky, in order to gain information for the teacher guidelines and materials revisions. Materials revision were begun. Fay Leach and Chris Cozen were assisted by Margie MacDougall and Sharon Goldblatt in this work.

#### Work Planned for FY 1977

##### 1. Basic sensory experience kit (SOVI)

Revision of the kit, based on FY 1976 pilot data, will be completed. Teacher's guides for the use of the revised set of materials will be drafted. Both will be reviewed at an in-house review by APH staff and revised as necessary. These materials next will be subject to independent review by a panel of six outside experts. Materials will be changed as directed. Subsequently, the materials and teacher guidelines will be subjected to a trial-in-use by eight teachers of multihandicapped children chosen from representative programs throughout the U.S. Teachers will be trained in the use of the materials and then will use them with individual children over a period of 3 months. Usefulness of the materials will be evaluated and reported using especially developed forms. Suggestions for required modification or additions will be solicited. Final modifications of materials will be made as indicated. Sharon Bortner will be assisted by Margie MacDougall and Sharon Goldblatt in this project.

##### H. Primary Braille Reading Series (BEH)

#### Activity Completed during FY 1976

The basic purpose of this project is to provide severely visually handicapped children with a set of materials for learning to read braille which will help overcome many of the problems previously identified in this task. The series will include braille readers at the preprimer, primer, first, second, and third grade levels; workbook materials to accompany the readers; and teacher's manuals. The 1st year of this 3-year project was spent in developing a detailed interrelated set of specifications for the materials.

To write specifications, research on concept development in blind children tactile perception, braille reading, and general reading was reviewed and summarized. Standard vocabulary lists were analyzed and braille oriented lists were identified. This information was summarized in a draft set of specifications which was reviewed by a committee of expert consultants.

Hilda Caton, Eleanor Pester, and Sharon Goldblatt were responsible for this project.



### Work planned for FY 1977

During the 2nd year of the project a transition reader, three preprimers, and one primer will be written. Workbooks and teacher's manuals will also be developed. Actual development will be undertaken by an expert in the development of primary reading series. This developer will be guided by the specifications written during the 1st year of the project and will work under close supervision of the project staff. Development efforts will be closely reviewed by several braille teaching experts and one expert from the general field of reading. Pilot tests of the materials will be made.

Hilda Caton, Eleanor Pester, and Sharon Goldblatt will represent APH on this project.

## H. Other Research and Development

### Work during FY 1976

#### 1. Basic reference materials for the partially sighted (SOVI)

This project has not progressed as originally planned. Its primary objective was to develop a set of basic reference materials, those normally presented in tabular form, in a format suitable for use by the partially sighted. Review of tabular materials indicated that the need for such may not be as great as originally thought. In an attempt to identify the types of tables that might need redesigning for use by the partially sighted, approximately 150 elementary and secondary level textbooks were reviewed. Many tables were found, but most were text specific and incorporated into the text rather than being "tool" type tables (i.e., those found at the back of a book and used with the content from throughout the book). Tool type tables for which use problems were suspected primarily occurred in mathematics books for grades 7-12. This finding is consistent with information acquired to the effect that the greatest demand for tables from the National Braille Association's Braille Technical Tables Bank is for mathematics and statistics tables. June Morris and Debbie Hill have worked on this project.

#### 2. Adaptation of self-instructional systems for the visually handicapped (SOVI)

The purpose of this project was to review currently available, inexpensive, self-instructional, teaching systems in an attempt to identify one that might be adapted for use with the visually impaired. Commercial catalogues were searched and several possibilities identified. After direct review of these, one system, Flex-Ed, was selected for intensive study. Review of the hardware of this system showed it could readily be adapted and trial adaptations appeared successful.

The Flex-Ed instructional programs were reviewed by outside consultants and research staff for suitability for braille adaptation. These programs received positive evaluation in terms of presentation for independent student work, adaptation to braille, and usability for large type readers. However, enough criticisms of the programs, in terms of lack of developmental sequencing, planning, and purpose; for inadequate coverage of concept areas; and lack of provision for adequate drill, were made to lead to the decision to defer adaptation of this system until more adequate written programs were available.

### 3. National Needs Assessment (SOVI)

The National Needs Assessment is sponsored by BEH with Educational Testing Service as the primary contractor. Its purpose is to survey the field of special education for specific materials needs as well as other materials related needs. During the year, APH research personnel participated in development of the questionnaires for this survey by identifying item domains, writing survey items, and through expert review of related materials. All staff participated in this effort.

## Work Planned for FY 1977

### 1. Basic reference materials for the partially sighted (APH)

Initially, specifications for tables for use by the partially sighted will be drawn up. Then, several mathematics tables will be designed in appropriate formats. Criteria for the selection of these tables will be anticipated need (e.g., a metric-English conversion table) and/or that the table be a tool type table for which use problems were identified in the textbook review (e.g., a table giving squares, square roots, cubes, and cube roots of numbers). June Morris will be responsible for this project.

### 2. National Needs Assessment (SOVI)

In the fall of 1977, Educational Testing Service will distribute the questionnaires nationally. Data for the visually handicapped will be analysed and sent to the APH SOVI. A report describing the materials needs of the visually impaired will be written by SOVI personnel.

### 3. Revision of the Utilization of Low Vision Kit (BEH)

The Utilization of Low Vision Kit was developed by Dr. Natalie Barraga and has been distributed by APH since 1970. Its subsequent worldwide use and evaluations have revealed several areas of needed improvement. A 4-year program to revise these materials has been planned. June Morris and Amie Dennison will work with Natalie Barraga on this project.

### 4. Educational games (APH)

Games of educational value for primary-level sighted children will be identified. Approximately 12 of these games will be selected and designed or adapted for use with visually handicapped children. These games will be constructed and evaluated through field testing with visually handicapped children and through reviews by teachers of visually handicapped children. Eleanor Pester will be assisted by Ken Coy on this project.

## 5. Relationship between visual acuity and reading medium of blind students (APH)

The purposes of this study will be to determine the reading medium(s) being used by legally blind students having varying degrees of vision and to learn where these students are being educated and at what grade levels. Analyses will be based on data from the 1976 registration of blind students through APH. The study will be a replication of previous studies based on similar data for 1960, 1963, 1966, 1969, and 1972, respectively. Comparisons of the 1976 data with that from the earlier studies will help identify trends in educational practices for this population. June Morris will be assisted by Debbie Hill on this project.

## AGENCIES PARTICIPATING IN RESEARCH DURING THE YEAR

Special thanks are due to the schools and other organizations whose facilities and students participated in the research and development effort. Residential schools for the blind include Alabama, Arkansas, Florida, Georgia, Governor Morehead, Kentucky, Michigan, Missouri, New York Institute, Ohio, Texas, and Utah. Public school programs involved were De Kalb County, Georgia and San Diego Unified Schools, California. Special programs participating included Blind Children's Center, Inc., Los Angeles California; Center for Effective Learning, Virginia Beach, Virginia; Child Evaluation Center, University of Louisville School of Medicine, Kentucky; and Variety Club for Blind Babies Foundation, San Francisco, California.

## RESEARCH AND DEVELOPMENT PERSONNEL FOR FY 1976

Butterfield, Larry, MA - Educational Research Assistant  
 Caton, Hilda, EdD - Educational Research Scientist  
 Coy, Ken - Educational Materials Technician  
 Cozen, Christine, MA - Educational Research Associate  
 Franks, Frank, EdD - Educational Research Scientist  
 Goldblatt, Sharon, BS - Educational Research Assistant  
 Goldstein, Karen, BA - Educational Research Assistant (part-time)  
 Hill, Deborah, BA - Educational Research Assistant  
 Leach, Fay, EdD - Educational Research Scientist  
 MacDougall, Margaret, BA - Educational Research Assistant  
 Morris, June, MA - Behavioral Research Scientist  
 Nolan, Carson, PhD - Director, Department of Educational Research  
 Pester, Eleanor, MS - Educational Research Associate  
 Powell, Enola - Secretary



## PUBLICATIONS DURING FY 1976

- American Printing House for the Blind. Supplemental directions for administering braille and large type editions, Durrell Listening-Reading Series, advanced level, forms DE and EF. Louisville, Ky.: Author, 1976. (prepared by J. E. Morris)
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- American Printing House for the Blind. Supplemental directions for administering braille edition, Durrell Listening-Reading Series, primary level, forms DE and EF. Louisville, Ky.: Author, 1976. (prepared by J. E. Morris)
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- Schatz, D., Franks, F. L., Thier, H. D., & Linn, M. C. Hands-on science for the blind. Science & Children, 1976, 13, 21-22.

## CONSULTANTS DURING FY 1975

Consultants in Auditory and Oral Language Development

Mrs. Kay Loss, Language Program Arkansas School for the Blind, Little Rock  
Arkansas

Dr. Michael Hawn, Specialist--Music Education of Children, Southern Baptist  
Theological Seminary, Louisville, Kentucky.

Mrs. Carol Wray, Parent-Infant Educator, West Suburban Association, Lombard,  
Illinois

Mrs. Ethel Merwin, Coordinator of Special Education, New Orleans Regional  
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Consultants in Metric Measurement

Mrs. LaRhea Sanford, Teacher, Florida School for the Deaf and the Blind,  
St. Augustine, Florida

Mr. Tuck Tinsley III, Teacher, Florida School for the Deaf and Blind,  
St. Augustine, Florida

Mrs. Ella Jean Washington, Teacher, Florida School for the Deaf and Blind,  
St. Augustine, Florida

Mr. Todd Sebright, Teacher, Michigan School for the Blind, Lansing, Michigan

Mr. John Fant, Itinerant Teacher for the Visually Impaired, De Kalb County  
Schools, Georgia

Mrs. Rosina Frazier, Teacher, San Diego Unified Schools, San Diego, California

Dr. William Dunlop, Professor of Mathematics Education, University of Louisville,  
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Consultant in Science

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Mrs. Ella Jean Washington, Teacher, Florida School for the Deaf and Blind  
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Consultant in Listening

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Consultants for the Primary Braille Reading Series

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Mrs. Ruth Craig, Supervisor, Special Education of the Visually Handicapped, Brigham Young University, Provo, Utah

Miss Freda Henderson, Curriculum Director, Tennessee School for the Blind, Nashville, Tennessee

Dr. Earl Rankin, Director, Graduate Studies in Reading, Department of Curriculum and Instruction, College of Education, University of Kentucky, Lexington, Kentucky

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## Pamphlet File

## DEPARTMENT OF EDUCATIONAL RESEARCH

## Professional Library

## IMRC/APH

## REPORT ON RESEARCH AND DEVELOPMENT ACTIVITIES

## FISCAL 1977

Most activities of the Department of Educational Research during this year involved the development or adaptation of educational materials and were as proposed in the Department's FY 1976 annual report. These included materials development in the areas of sensory stimulation, language development, educational games, braille reading, low vision training, social studies, science, mathematics, and educational measurement. Other research was directed at relating reading medium with degree of vision and examining conceptual development in the visually handicapped.

This was the 1st year in which funding was available for research and development through the annual appropriation, which will represent the Department's primary source of support in the future. It was also the 3rd and final year for research and development to be partially supported through the American Printing House for the Blind's (APH) contract with the Bureau of Education for the Handicapped (BEH) to serve as the Special Office for the Visually Impaired (SOVI). The new monies were used to support a number of projects and also will be used to complete those projects initiated, but not completed, with Special Office funds. Additionally, two other projects were supported through separate BEH grants.

Members of the Department's staff have continued to use, and increased their use of, professionals from the field. Some have served as consultants while others have actively participated in the development of materials. This has proved to be an excellent procedure as it enables us to utilize the best of existing expertise in a cost efficient manner. Persons who have served in these capacities during this year are listed at the end of this report.

As always, our colleagues in the field and our co-workers at APH have gone beyond the call of duty in rendering support to our research program. To all, we are beholden and trust that the fruits of our mutual efforts will warrant their continuing support.

## Progress in Specific Research Activities

In this section summary reports will be found indicating work that has been done on the various projects during FY 1977 and work that is planned for FY 1978. The project leader responsible and the other staff who worked on the project are identified at the end of each project description. As in other years, Ken Coy, our Educational Materials Development Technician, has made substantial contributions to many of our projects. The source of financial support for the projects will be shown at the end of the title of each. (APH) will indicate Printing House support through the appropriated research and development monies, (SOVI) will indicate support from this contract, and (BEH) will indicate support from other BEH-USOE/DHEW grants.

### Sensory Stimulation Kit--Materials for Multihandicapped, Visually Impaired Students (SOVI)

Work completed during FY 1977. Revisions of the kit items, based on pilot data and consumer recommendations, were completed. The guidebook was drafted and included guidelines for using the materials, developmental summaries of the five sensory modalities, recommended readings, environmental activities encouraging sensory stimulation, and an evaluation form for the teacher to complete after using the materials. In addition, tasks for each of the 25 items in the kit were written for children functioning from a nonresponsive level to an independent manipulation response level. A data sheet was formulated for each kit item to record the individual progress of the students.

The kit items and accompanying guidebook, tasks, and data sheets were reviewed by six consultants familiar with materials needs of multi-handicapped, visually impaired children. Revisions were made following consultant and in-house reviews. Arrangements were made to field test the materials in programs for multihandicapped, visually impaired students. The Sensory Stimulation Kit was field tested for 3 months in 11 programs, involving 129 students in residential, public school, and private agency programs. Several preschool programs for visually impaired children were included to determine the applicability of the kit to children functioning on a developmental level of 3 to 5 years. Three testing sites used the materials with parents in a home-based program.

Child data was collected and pre-post results were analyzed to determine differences between experimental and control group students and teacher evaluations, eliciting information from 17 experimental teachers on all phases of the Sensory Stimulation Kit, were analyzed. Sheri Bortner was assisted by Sue Simon, Margaret Jones, Sharon Goldblatt, and Jim Weber on this project.

Work planned for FY 1978. Results of the field test indicated certain revisions that would improve the kit items, guidebook, and task cards. These changes will be made after which the Sensory Stimulation Kit will be presented for production approval. Additionally, mediated demonstration materials (audio-visual) will be prepared illustrating use of this project. Sheri Bortner and Sue Simon will be responsible for this work.

Materials for Motor Skill Development--Materials for Multihandicapped, Visually Impaired Students (APH)

Work planned for FY 1978. The motor skills project will develop materials to enhance the acquisition of motor skills in multihandicapped, visually impaired students, emphasizing the fine motor skill area. The project will provide educational materials for fine motor development at several skill levels as well as a listing of appropriate commercial gross motor materials and accompanying tasks. Three to five tangible motor materials will be developed within the project scope, ranging from an adaptation of the commercially available Busy Board to prevocational training materials.

A literature and curriculum review will be undertaken, along with several program visitations, to determine motor materials used and needed in programs for multihandicapped, visually impaired students. A compilation and review of commercial materials will follow. Developmental sequence norms for the acquisition of motor skills will be reviewed. Suggestions of motor materials to adapt or develop will be compiled and presented to a committee for assistance in selecting and prioritizing materials for the motor skills project. Prototype materials will be prepared and submitted for in-house review. Sheri Bortner will be the project leader and will be assisted by Sue Simon.

Sing about Me--Basic Approach to Beginning Language/Auditory and Oral Language Skills (SOVI)

Work completed during FY 1977. An in-house review was conducted to evaluate the Basic Approach to Beginning Language (BABL) materials developed thus far. In conjunction, a review of commercial materials useful in teaching of communication skills to language delayed children was conducted. Work proceeded on the Sing about Me (SAM) materials, a major component of the BABL program.

The SAM materials consist of 28 original songs based on common experiences of young children. The songs are designed for young, visually impaired children who are speaking in simple phrases and sentences. The songs were pilot tested with children at developmental levels of 2, 3, and 4 years. Simultaneously, the SAM tunes were evaluated by three music specialists, familiar with young or multihandicapped, visually impaired children, on the basis of technical quality and appropriateness for blind children. Revisions were made and included changes of instrumentation, vocalists, tempo, and key. A guidebook was drafted which included teaching suggestions, a chart of concepts introduced in each song, musical notation for each song, and related resource materials. A task card, suggesting five to seven activities to enhance the concepts introduced in each song, was written. A teacher evaluation form was designed to evaluate each song and the accompanying task cards and guidebook.

The SAM materials were field tested for a 4 to 6 week period in 25 programs for preschool on multihandicapped, visually impaired children. Residential, private agency, and public school programs were utilized in various geographic locations throughout the United States for field



testing the SAM materials. Both classroom teachers and music specialists evaluated the songs. Margaret Jones, Sue Simon, Sharon Goldblatt, and Kathy Simpkins assisted Sheri Bortner in this project. Jim Kerns, of APH's Talking Book Department, assisted in the recording of the songs.

Work planned for FY 1978. The field test data will be compiled and analyzed to determine necessary revisions in areas such as tempo, word content, rhythm, melody, key, voice clarity, instrumental quality, and relevance in promoting language development. Improvements needed in the guidebook and activity cards will also be determined from the evaluations completed by the field testers. After revisions have been identified, a committee of music specialists will review the proposed changes. Re-recording will be initiated as well as revision of the guidebook and activity cards. Master tapes will be prepared for final editing and evaluation. A copyright will be applied for and the SAM materials will be presented for production approval at the 1978 annual meeting. Sheri Bortner will be assisted by Sue Simon on the SAM project.

#### Language Demonstration Materials--Basic Approach to Beginning Language/ Auditory and Oral Language Skills (APH)

Work planned for FY 1978. The language demonstration materials will be designed for multihandicapped or young, visually impaired children who are acquiring expressive language. The materials will be most appropriate for the teachers, paraprofessionals, and parents of children who are non-verbal or have very limited communication skills. The proposed Language Demonstration Materials would include four or five cassette tape presentations of experiences common to a young child, such as taking a bath, and concrete examples of how to promote language development through such experiences.

Literature and commercial language material reviews will be undertaken. Prototype APH adult demonstration tapes, contained in the BABL program, will also be reviewed. The language development sequence will be studied and used as a basis for determining appropriate content for the materials. The audio materials will be written, recorded, and then pilot tested. Revisions will be made after which the language demonstration materials will be field tested. Sheri Bortner will be assisted by Julie Jones and Sue Simon on the Language Demonstration Materials project.

#### Educational Games (APH)

Work conducted during FY 1977. The purpose of this project is to provide games for young, visually handicapped children that can be played with their sighted peers. During this year, over 96 top selling commercial games for children 8-years old and under were identified and reviewed. The 30 most promising were purchased and reviewed at a workshop on games held at APH during March 1977. Recommendations from the workshop were: (1) that four of the games, Sneaky Snake, Silly Sandwich, Walk along Sesame Street, and Three Little Pigs, be adapted and (2) that a game kit be developed for use with visually handicapped children. Specifications for the game kit were that it be open-ended and that it should include such things as a tactile spinner, tokens, dice and a pass-around container for rolling, an open-ended game board, discard and draw racks,

card holders, and blank cards. It was noted that some of the games reviewed required little or no adaptation to make them suitable for use by young, visually handicapped children. Following the workshop, adaptations of Sneaky Snake and Silly Sandwich were made and a pilot study was conducted comparing two versions of the former. Eleanor Pester was assisted by Debbie Hill on this project.

Work planned for FY 1978. The major objectives for the 2nd year of this project are to field test Sneaky Snake and Silly Sandwich, with both individual children and groups of children, and to develop a list of commercial games, along with suggestions for simple adaptations, that can be used by visually handicapped children. Debbie Hill will assist Eleanor Pester with this project.

#### 1976 Reading Medium Study (APH)

Work completed during FY 1977. In this study the relationships between visual acuity, reading medium, grade level, and type of educational program were examined. Data used were those obtained in the 1976 registration of legally blind students through APH. Part I of the study replicated previous studies based on similar data for 1960, 1963, 1966, 1969, and 1972 making possible not only a study of the 1976 population, but also trends. Part II of the study was designed to take a closer look at the 32% of the total student enrollment classified in 1976 as "ungraded" along with two other special disability groups. In this part seven groups (mentally retarded, multihandicapped, nongraded "normal" students, deaf-blind, nursery school, learning disabled, and cerebral palsied) were examined in terms of degree of vision, reading medium used, reading level, and educational program. Debbie Hill, assisted by June Morris, was responsible for conducting this study.

Work planned for FY 1978. The results of this study will be written up and submitted for publication by Debbie Hill.

#### Beginning Braille Reading Series (BEH)

Research completed during FY 1977. The basic purpose of this project is to provide severely visually handicapped children with a set of materials for learning to read braille which will help to overcome many of the problems previously identified in this task. The series will contain a transition reader, three preprimers, one primer, a first grade reader, a second grade reader, and a third grade reader.

The 1st year (FY 1976) of the project was spent in developing a detailed interrelated set of specifications for the materials. These specifications were written after research in concept development in blind children, tactual perception, braille reading, and general reading was reviewed. The specifications were reviewed and approved by a committee of expert consultants in braille reading and general reading. Following this, the specifications were given to a consulting editor who has had extensive experience in writing and editing children's reading materials. Using the specifications, and



working closely with staff members and the braille consulting committee, the consulting editor completed writing the transition reader, three preprimers, and the primer during the 2nd year (FY 1977) of the project. The completed readers consist of the children's text, children's workbook (worksheet) materials, and teachers' guides. Evaluation of the transition level was also conducted during the 2nd year of the project. This evaluation involved the use of the reader and accompanying materials with children. Evaluation data were reviewed by the braille consulting committee and revisions based on the results initiated. Hilda Caton, Eleanor Pester, and Sharon Goldblatt have been responsible for this project.

Work planned for FY 1978. During the 3rd year of the project, the writing of the first, second, and third grade readers will be completed. Also, evaluations of the preprimers, primer, and first grade reader (if students progress to this level) will be completed. Revisions of the materials will be made as the evaluation data for each are analyzed. Hilda Caton, Eleanor Pester, and Sharon Goldblatt will continue to be responsible for this project.

#### Criterion Referenced Tests for Beginning Braille Reading Series (APH)

Work planned for FY 1978. The purpose of this project is to develop a set of criterion referenced tests to accompany the Beginning Braille Reading Series being developed at the APH. A total of six tests will be developed to accompany the following levels of the readers: transition level reader, preprimers, primer, first grade reader, second grade reader, and third grade reader.

Prior to initiating development of the test for the transition level reader, a short pilot test was conducted to determine the most appropriate response mode(s) for visually handicapped children at this level. Subjects were braille readers, ages 6-9. Results indicated that written responses required about 50% more time than oral responses at this level. Therefore, test item responses at this level will be oral whenever possible.

The entire battery of tests will be developed as children in the reading program advance through it, with work to be initiated during FY 1978 and completed in FY 1979. The delay in development of the tests will be due to the fact that test items cannot be tried with children until they have completed the reader for which the test is being designed.

The tests will be designed by Earl Rankin, an expert in the area of test development. Actual items will be written by the project staff and reviewed by content specialists familiar with the Beginning Braille Reading Series. Dr. Rankin will be responsible for all data analyses. The project will be directed by Hilda Caton who will be assisted by Eleanor Pester and Sharon Goldblatt.

#### Planning Institute--Braille Textbook/Workbook Formats (APH)

Work planned for FY 1978. Visually handicapped children have traditionally encountered problems in the use of reading textbooks and workbook



materials which have been transcribed into braille. Even with careful editing, these problems continue to exist. In order to identify specific problems which exist in relation to the materials and to attempt to find solutions to the problems, an institute is being planned for early spring 1978 at APH. The basic purposes of the institute will be: (1) to identify problems encountered by visually handicapped children in using braille reading textbooks and workbook materials in their present format, (2) to make recommendations related to more appropriate formats for these materials, and (3) to specify the role the APH can most effectively play in implementing these recommendations.

The procedure to be used will be to form a committee of expert teachers and consultants in the area of braille reading who will be willing to meet at APH to address these problems. After the meeting is concluded, a report containing the recommendations of the committee will be written. Based on this report, a decision will be made regarding the feasibility of pursuing a full research project in this area. Hilda Caton and Annette Bettinger, of APH's Editorial Department, will conduct the institute.

#### Revision of the Utilization of Low Vision Kit (BEH)

Work completed during FY 1977. The Utilization of Low Vision Kit was first produced and sold by APH in 1970. Its primary components are a Visual Efficiency Scale and a Teacher's Guide. Although this Kit is quite useful and has been widely used, feedback has indicated that the materials are in need of revision and expansion. The purpose of this project is to do just that.

Work on the project was initiated during this year. It included a literature review of experimental research in visual perception, visual assessment, the sequence of normal visual development, and other factors related to visual impairment; a review of teacher's guides and kits to determine their content, format, and packaging; a review of visual assessment instruments; the development of specifications for the teachers' materials and the assessment instrument; and the overall outlining of the program. During this time a meeting was held with the project consultants to obtain input from them prior to initiation of work on the new materials. The new materials will be called "Program to Develop Visual Functioning." These materials will include teachers' materials, a Visual Assessment Procedure, and a kit of materials for use with the assessment procedure. The project is being done in collaboration with Natalie Barraga (the originator of the original Kit) and her assistants at the University of Texas (Austin) who are Marcia Collins and Jim Hollis. June Morris and Amie Dennison are the APH personnel who are responsible for this project.

Work planned for FY 1978. The teachers' materials and the Visual Assessment Procedure will be revised and expanded, as specified, after which they will be subjected to review by the project consultants. Subsequently they will be modified on the basis of the review results. Concurrently, needs and specifications will be determined for the basic student materials kit and accompanying lists of commercial materials, items for the kit will be assembled, commercial materials meeting the specifications

identified, and descriptions for their use written. Both the kit items and the descriptions will be reviewed by the project consultants and revised as necessary. Project staff will include Natalie Barraga, Marcia Collins, and Jim Hollis from the University of Texas and June Morris and Amie Dennison, from APH, who will be assisted by Jan Moseley, Ellen Shapiro, and Julie Jones.

#### Spatial Concepts of the Visually Handicapped (APH)

Work completed during FY 1977. Research on tactile maps in recent years has emphasized the problems of map design and legibility. Also contributing to the problems of map reading are the individual's level of conceptual development, tactual abilities, and ability to interpret what is read. Prior to exploring these problems further, a broad review of the literature related to spatial concepts, tactual perception, and the use of tactile displays was conducted for the purpose of identifying how these concepts might be related to a visually handicapped individual's conceptualization of space. The review was conducted by Kathy Simpkins.

Work planned for FY 1978. The first of a series of studies will be conducted during the fall of 1977. In it, young, visually handicapped and sighted children, both with and without previous school experience, will be examined to identify their concepts of space. In the first part of the experiment familiar household objects will be presented for tactual inspection, identification, and matching. In the second part simple and complex shapes will be matched tactually. Included in the study will be an analysis of the tactual exploratory behavior used. From the results of this first study, additional studies will be planned and executed during the year which will examine both spatial concepts and the tactual exploratory techniques affecting conceptual development. Kathy Simpkins will be responsible for this work. She will be assisted in the initial study by Julie Jones.

#### Tactile Map Kit (APH)

Work completed during FY 1977. Concurrent with the review of literature on spatial concepts, another was conducted of tactual reading techniques, interpretation of tactile displays, legibility of tactile displays, and production techniques for tactile displays. The review was conducted to obtain information on what materials might be appropriate and desirable for inclusion in a tactile mapping kit. This review was done by Kathy Simpkins.

Work planned for FY 1978. During this year, additional information on tactual perception and on the construction of tactile displays will be accumulated. From this information and that obtained from meetings with consultants and potential consumers, preliminary specifications for the kit will be compiled and an initial prototype kit prepared. The kit will be subjected to limited review and a first draft of a teacher's guide prepared. Kathy Simpkins will be responsible for the development of this kit.

### Continental Relief Map Cassette Program (APH)

Work planned for FY 1978. This project is designed to provide audio materials for use with Simplified Continental Relief Maps distributed by APH. Three tapes will be developed to accompany each relief map; North America, South America, Europe, Asia, Africa, and Australia. The first tape in each series will include an introduction and provide a guide for the tactual exploration of the continent. The script will review basic landform terms and will relate them to actual features on the earth's surface. The second tape will focus on specific features of that continent, naming some of the important rivers, lakes, mountains, and other pertinent geographic features. The third tape in the series will include socio-historical information such as where people live now, original patterns of settlement, location of important cities on the continent, and significant historic sites. Each tape will be from 10-20 minutes in length. This project will be co-directed by Frank Franks and Jack Miller.

### Individualized Light Experiments (SOVI)

Work completed during FY 1977. Ten previously drafted light experiments in five units were revised and subsequently reviewed by teachers who used the materials and aids with legally blind elementary grade students (grades 4-8). Teachers and students were particularly pleased with the taped programs accompanying the experiments. Performance of the experiments is facilitated by use of the cassette programs, which eliminate constant movement from a braille or large type text to the experiment work space. Braille and large type copies were requested by teachers and students, however, for use as reference copies.

The experiments are outlined below by unit.

#### UNIT 1: How light travels

- 1) The light sensor can detect a beam of light.
- 2) A beam of light travels in a straight line.

#### UNIT 2: Transparency

- 1) The light box can be used to identify transparent and opaque object.
- 2) The light box can be used to distinguish between transparent and translucent objects.

#### UNIT 3: Introduction to light reflection

- 1) The surface of an object may reflect or absorb light.
- 2) A flashlight is an energy source which projects light.

#### UNIT 4: Light reflection using mirrors

- 1) A mirror can be used to reflect light.
- 2) A second mirror can be used to produce a periscope effect.



#### UNIT 5: Light polarization

- 1) Polarized light rays can be blocked--the experiment.
- 2) Polarized light rays can be blocked--the tactual demonstration.

The success of young blind students in using the APH Light Sensor and in performing these individualized experiments indicate that such students can perform sophisticated light experiments which previously have not been available to them because of the highly visual nature of experiments in light. These experiments will be presented for production approval. Frank Franks directed this project.

#### Biological Models Development in Cell Division (Mitosis) (APH)

Work completed during FY 1977. Several years ago, in response to needs indicated by science and biology teachers, development of a set of biological models (tactile schematics) for use by blind students at the upper grade levels was initiated. Since then, there has been a persistent request for "models" for blind students which can be used in lieu of visual enlargements and microscope slides. While tactile representations do not replace microscopic projections and visual diagrams, they can provide the blind student with information about the organization of various structures. This year work has resumed on biological models with the development of a series of models that show cell division (mitosis). The series showing cell division can extend the knowledge of blind students beyond what is written in text description by providing information on the organization of the cell and indicating the changes that occur in the different stages of cell division. Working models depicting seven phases of mitosis have been completed and a content outline for developing an audio-tutorial program drafted. Frank Franks and Ruth Gough, of Henderson Community College, have been developing these materials.

Work planned for FY 1978. Seven prototype models will be prepared and accompanying audio-tutorial programs written. Following the development of appropriate evaluation instruments, both the models and the audio-tutorial programs will be subjected to a limited field trial. This work will be done by Frank Franks and Ruth Gough.

A needs meeting will be held during the spring of 1978 to identify needs for additional biological aids and to prioritize such needs. Tentative specifications suggested for the models will be noted. Frank Franks will be responsible for organizing this meeting.

#### Metric Measurement Materials and Aids (SOVI)

Work completed during FY 1977. The metric measurement readiness program was designed to introduce basic measurement operations in linear measurement, volume, mass, and area. The scope of the program includes the development of instructional materials that (1) provide prenumber measurement activities, (2) utilize basic number concepts taught by the teacher, and (3) combine the two to introduce number measurement. The

activities developed emphasize prenumber measurement experiences that will provide background for the higher degree of abstraction required for measurement using numbers. Process related activities in classifying, comparing, ordering, and measuring are integral components of the instructional program. Formative evaluation of the program indicated its appropriateness for use with visually handicapped students.

Linear measurement materials and hands-on manipulative activities were developed during this year and are ready for field evaluation. Measurement activities focus on tactual inspection and identification of the component parts of measuring aids that will be used later in performing measurement activities with numbers. With the introduction of standard metric units, the student repeats the operational tasks he has learned, but this time with numbers. When the student has successfully completed this program, he should be ready to perform metric measurement activities that appear in mathematics textbooks.

As a part of this project available metersticks were examined and found unsuitable for use by young blind students because of symbol clutter. Consequently, specifications for an APH meterstick were determined. This project has been directed by Frank Franks. He was assisted by Debbie Hill. Working closely with the APH project staff have been LaRhea Sanford and Tuck Tinsley of the Florida School for the Deaf and the Blind.

Work planned for FY 1978. The linear measurement readiness section of the metric measurement program will be evaluated by teachers who will use the program with elementary grade blind students. The teacher evaluation will focus on the usability of the materials and on the appropriateness of the program for visually handicapped students.

Basic measurement aids and introductory concept-related activities in volume (capacity) have been identified. During FY 1978, formative development of the volume readiness section of the metric measurement program will occur. Appropriate aids will be developed/adapted and will be tested for legibility, manipulability, and discriminability when necessary.

Concept-related activities in mass (weight) involving the use of appropriate tangible aids also will be drafted during FY 1978. Subsequently, the mass readiness section of the metric measurement program will be written. This project will be directed by Frank Franks, who will be assisted by Debbie Hill and Bob Glass. As before, APH project staff will be assisted by LaRhea Sanford and Tuck Tinsley of the Florida School for the Deaf and the Blind.

## Two- and Three-Dimensional Relationships in Mathematics (SOVI)

Work completed during FY 1977. A tactile mathematical aid has been developed at APH for use in introducing/illustrating/demonstrating a broad range of spatial concepts to blind students (grades K-12) utilizing a hands-on approach. Students can progress from two-dimensional to three-dimensional relationships using the aid. The two-dimensional part consists of a square board with regularly spaced holes connected by grooves. The student can move forward, backward, left, or right on it by counting



spaces and moving pegs or placing vertical sticks to perform a number of spatial activities. An overlay, identical to the two-dimensional board except that it has a center hole, can be fitted over another math board with a center post to make a three-dimensional aid. The overlay can be moved up or down on the center post to perform numerous three-dimensional activities such as locating points, lines, and surfaces in space.

In another phase of this project mathematics curricula were reviewed through textbook inspection and spatial concepts identified that blind students traditionally have difficulty comprehending because of their highly visual and abstract nature. From this, a tentative outline was drafted for a student manual. The purpose of this manual is to provide activities to teach those spatial concepts identified as difficult through use of the aid. Frank Franks and Debbie Hill were the APH personnel who have worked on this project. Working closely with them was Tuck Tinsley of the Florida School for the Deaf and the Blind.

Work planned for FY 1978. This year will be devoted to the preparation of the manual of activities illustrating various two- and three-dimensional relationships in mathematics and the development of additional parts to be used in conjunction with the aid (e.g., markers to represent line segments in space). The draft of the users' manual and the aid will be reviewed by a panel of expert mathematics teachers of blind students. Subsequently, the manual will be revised and the aid modified as indicated by the review. This project is being directed by Frank Franks. Debbie Hill and Bob Glass will assist him with it.

#### APH Student Speech Plus Calculator (APH)

Work completed during FY 1977. The APH Student Speech Plus calculator is a special version of the Speech Plus <sup>TM</sup> calculator developed by Telesensory Systems. The APH unit incorporates several exclusive features which were suggested by research and experience. One of the special features of the APH Student Speech Plus talking calculator is a two-speed readout rate for the visual display. This feature resulted from research done during FY 1977 in which three readout rates were compared using groups of students ranging in grade level from 3-12. The fastest readout rate used in the evaluation was that found on the Speech Plus calculator. The middle rate was 75% of the fastest and the slowest was 50% of the fastest. Findings were that some students from the lower grades were not able to keep up with the fastest or middle readout rates when attempting to write out numbers being read using braillewriters. Other findings were that the great majority of students preferred either the middle or slowest readout rate. This evaluation was conducted by June Morris.

Work planned for FY 1978. The APH Student Speech Plus calculator has an accompanying Owner's Manual and Application Booklet. Both are modified versions of similar booklets published by Telesensory Systems. In addition to these, a manual will be developed of secondary supplemental enrichment exercises for use with the APH Student Speech Plus calculator. The manual will be designed for individual use and will contain user oriented activities, relevant to today's society, derived from several



facets of mathematical education. Such a manual will provide an opportunity for additional practice with the calculator which should enable the user to gain skill in its operation. Frank Franks will direct this project. The manual will be drafted by William Lamon of the University of Oregon at Portland.

#### Adaptation of Educational Measures (APH)

Work completed during FY 1977. In response to a previously identified need for a diagnostic oral reading test, the Gilmore Oral Reading Test was prepared for braille and large type production and its directions modified appropriately for use in administering the tests in these media. This test had been identified previously as the most suitable of those available for adaptation. June Morris was responsible for this work.

Work planned for FY 1978. APH has been publishing tests for the visually handicapped since about 1920. Rather than developing new tests, it has been found more economical, efficient, and effective to adapt print tests that are commercially available. In recent years, APH has been attempting to adapt one or two tests each year. During March 1973 a meeting was held with a test advisory group to help determine the needs of the field for tests and then to prioritize these needs. As all high priority tests identified at that time have now been adapted, it is time to hold another such meeting to determine current needs. Such a meeting will be held during the spring of 1978. June Morris will be responsible for organizing and conducting it.

#### Projects Planned for FY 1977 but Not Completed

Basic reference materials for the partially sighted (APH). The primary objective of this project was to develop basic reference materials, such as tool type tables, in a format suitable for use by the partially sighted. As available materials were reviewed, it became obvious that supposed needs were being met. Consequently, the project was dropped. June Morris was responsible for the work done on it.

National Needs Assessment (SOVI). The National Needs Assessment was sponsored by BEH with Educational Testing Service being the primary contractor. The purpose of the project was to document, on a national basis, the educational needs of handicapped students by surveying special education teachers and supervisors. Data were to have been collected on instructional materials development; media, materials, and instructional technological training; media and materials information; and materials distribution. Once the data were in and tabulated, APH personnel were to have interpreted and written up that part which pertained to the visually handicapped. Unfortunately, Educational Testing Service was not able to collect the data during FY 1977. They hope to be able to do so during FY 1978. Although there are no formal arrangements for APH to participate at this time, such information would be extremely useful in the long range planning of our research and development program. Therefore, if feasible, we will participate in the analysis of these data.

Agencies Participating in Research during FY 1977

The endeavors of the Department of Educational Research would founder hopelessly if it was not for the splendid cooperation of the administrators, staff, and students at the many schools and agencies throughout the country who participate in our studies. To all, we are grateful. During this year the following schools and agencies have taken part:

Blind Children's Center, Los Angeles, California  
Broadleigh School, Columbus, Ohio  
California School for the Blind, Berkeley, California  
Chicago Lighthouse for the Blind, Chicago, Illinois  
Child Evaluation Center, Louisville, Kentucky  
Child Study Center, Oklahoma College of Medicine, Oklahoma City,  
Oklahoma  
Como Special Program Units, St. Paul, Minnesota  
Dallas Services for Visually Impaired Children, Dallas, Texas  
Delaware Bureau for Visually Impaired, Wilmington, Delaware  
Developmental Disabilities Center of the Louisiana State University  
Medical Center, New Orleans, Louisiana  
Early Childhood Learning Center for Visually Impaired Children,  
Kensington, Maryland  
East San Gabriel Valley School, West Covina, California  
Florida School for the Deaf and the Blind, St. Augustine, Florida  
Foundation for Blind Children, Phoenix, Arizona  
Foundation for the Jr. Blind, Los Angeles, California  
Georgia Academy for the Blind, Macon, Georgia  
Glenrose Provincial Teaching Hospital, Edmonton, Alberta, Canada  
Indiana School for the Blind, Indianapolis, Indiana  
Infant Program for Visually Impaired Children, Mason, Michigan  
Kentucky School for the Blind, Louisville, Kentucky  
Maryland School for the Blind, Baltimore, Maryland  
Meeting Street School, East Providence, Rhode Island  
Missouri School for the Blind, St. Louis, Missouri  
Montana School for the Blind, Great Falls, Montana  
New York Association for the Blind, New York City, New York  
New York State School for the Blind, Batavia, New York  
Oak Hill School, Hartford, Connecticut  
Oregon State School for the Blind, Salem, Oregon  
Outland School for the Multihandicapped, Saratoga, California  
Perkins School for the Blind, Watertown, Massachusetts  
Project SERVH, Services to Visually Handicapped, Wellesley Hills,  
Massachusetts  
Robert Shaw Center, Dept. of Special Education, DeKalb Co. Schools,  
Scottdale, Georgia  
Rupley School, Elk Grove Village, Illinois  
Services for the Blind, Child and Family Division, Seattle, Washington  
South Bend Community School Corp., South Bend, Indiana  
South East Metropolitan Board of Cooperative Educational Services,  
Denver, Colorado  
Tennessee School for the Blind, Donelson, Tennessee  
Upsal Day School for the Blind, Philadelphia, Pennsylvania  
Valley Child Development Center, Cheswick, Pennsylvania

Washington Park School, Cincinnati, Ohio  
Washington State School for the Blind, Vancouver, Washington  
Wesley Community Day Care Center, Louisville, Kentucky  
West Central Joint School Services, Indianapolis, Indiana  
West Suburban Association, Lombard, Illinois  
Western Pennsylvania School for the Blind, Pittsburgh, Pennsylvania



Research and Development Personnel for FY 1977

Binkley, Barbara - Secretary

Bortner, Sheri, MS - Educational Research Scientist

Butterfield, Lawrence, MA - Educational Research Assistant

Caton, Hilda, EdD - Educational Research Scientist (part-time)

Coy, Ken - Educational Materials Development Technician (part-time)

Dennison, Amie, MA - Librarian of the Professional Library and  
Research Associate (part-time)

Franks, Frank, EdD - Educational Research Scientist

Goldblatt, Sharon, BS - Educational Research Assistant

Goldstein, Karen, BA - Educational Research Assistant (part-time)

Hill, Deborah, BA - Educational Research Assistant

Jones, Margaret, BA - Educational Research Assistant

Morris, June, MA - Assistant Director, Department of Educational Research

Nolan, Carson, PhD - Director, Department of Educational Research (2 months)

Pester, Eleanor, MS - Educational Research Associate

Regenauer, Sheila - Secretary

Simpkins, Katherine, PhD - Educational Research Scientist

Weber, James, PhD - Director, Department of Educational Research (9 months)

Consultants during FY 1977

Basic Approach to Beginning Language/Auditory and Oral Language Skills

Mrs. Chris K. Cozen, Louisville, Kentucky

Mrs. Ann Emmans, New York State School for the Blind, Batavia, New York

Dr. Fay W. Leach, Louisville, Kentucky

Mrs. Ethel Merwin, New Orleans Regional Special Education Service Center,  
New Orleans, Louisiana

Mrs. Carol Wray, West Suburban Association, Lombard, Illinois

Beginning Braille Reading Series

Mrs. Eddy Jo Bradley, Harper-Row Publishers, Evanston, Illinois

Mrs. Ruth Craig, Brigham Young University, Provo, Utah

Dr. Eric Hamp, University of Chicago, Chicago, Illinois

Dr. Philip H. Hatlen, San Francisco State University, San Francisco,  
California

Miss Freda Henderson, Tennessee School for the Blind, Nashville, Tennessee

Dr. Earl F. Rankin, University of Kentucky, Lexington, Kentucky

Dr. Evelyn Rex, Illinois State University, Normal, Illinois

Miss Marilyn Sorensen, Minnesota State Department of Education,  
St. Paul, Minnesota

Mrs. Bonnie Trowbridge, Douglas School, Pekin, Illinois

Mrs. Mila B. Truan, Tennessee School for the Blind, Nashville, Tennessee

Educational Games

Mr. Gary Crow, Kentucky Department of Human Resources, Louisville, Kentucky

Dr. Patricia Gallagher, University of Kansas Medical Center, Kansas City, Kansas

Mrs. Mildred Howard, Georgia Academy for the Blind, Macon, Georgia

Miss Mona Manning, Western Pennsylvania School for Blind Children,  
Pittsburgh, Pennsylvania

Mrs. Donald E. Pohlmann, Hastings, Nebraska

Mr. Marvin Sanford, Florida School for the Deaf and the Blind, St. Augustine, Florida

Miss Mary Jane Sims, Kentucky School for the Blind, Louisville, Kentucky

Mrs. Rose Skolnick, Logan Elementary School, Philadelphia, Pennsylvania

#### Mathematics

Mr. Tony Evancic, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Dr. William E. Lamon, University of Oregon, Eugene, Oregon

Mr. Tuck Tinsley III, Florida School for the Deaf and the Blind, St. Augustine, Florida

#### Metric Measurement

Mrs. Sandra Albrecht, Florida School for the Deaf and the Blind, St. Augustine, Florida

Dr. E. Glenadine Gibb, University of Texas, Austin, Texas

Miss Alva Howard, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mrs. LaRhea Sanford, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mr. Tuck Tinsley III, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mrs. Ella Jean Washington, Florida School for the Deaf and the Blind, St. Augustine, Florida

#### Science

Mrs. Patricia Anderson, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mrs. Mary Drakes, Georgia Academy for the Blind, Macon, Georgia

Dr. Ruth Gough, Henderson Community College, Henderson, Kentucky

Mrs. Mildred Howard, Georgia Academy for the Blind, Macon, Georgia

Mrs. Rebecca Hunton, Indiana School for the Blind, Indianapolis, Indiana

Ms. Carla McMillan, Kentucky School for the Blind, Louisville, Kentucky



Ms. Pat Moore, South Carolina School for the Deaf and Blind, Spartanburg, South Carolina

Mrs. LaRhea Sanford, Florida School for the Deaf and the Blind, St. Augustine, Florida

Ms. Norma Ueleke, Tennessee School for the Blind, Nashville, Tennessee

Mr. Howell Watkins, Georgia Academy for the Blind, Macon, Georgia

Mrs. Marsha Zehngut, Washington Park School, Cincinnati, Ohio

#### Sensory Stimulation Kit

Mrs. Ginger Alexander, Upsal Day School for Blind Children, Philadelphia, Pennsylvania

Mrs. Chris K. Cozen, Louisville, Kentucky

Mr. Bill Duckworth, Indiana State Department of Public Instruction, Indianapolis, Indiana

Miss Carmella Ficocello, South Central Regional Center for Services to Deaf-Blind Children, Dallas, Texas

Mrs. Sherry Raynor, Ingham Intermediate School District, Lansing, Michigan

Miss Toni Skinner, California School for the Blind, Berkeley, California

#### Social Studies

Mrs. Chris K. Cozen, Louisville, Kentucky

Dr. Jack Miller, George Peabody College for Teachers, Nashville, Tennessee

#### Utilization of Low Vision

Mrs. Marianne May Apple, Low Vision Abstracts, Westfield, New Jersey

Dr. Edward P. Berla', University of Louisville, Louisville, Kentucky

Mrs. Joyce Bromley, Materials Center for Visually Handicapped, Knoxville, Tennessee

Mrs. Pat Carpenter, The Robert Shaw Center, Scottdale, Georgia

Mrs. Ruth Holmes, Illinois Braille and Sight-Saving School, Jacksonville, Illinois

Mrs. Wilma A. Hull, The Alpha Group, Project SERVA, Wellesley Hills, Massachusetts

Dr. Randy Jose, Center for the Blind, Philadelphia, Pennsylvania

Dr. Rosemary O'Brien, Early Childhood Learning Center for Visually Impaired  
Children, Rockville, Maryland

Dr. Douglas K. Ozias, Governor's Office, Austin, Texas

Dr. Earl F. Rankin, University of Kentucky, Lexington, Kentucky

Mrs. Rose Skolnick, Logan Elementary School, Philadelphia, Pennsylvania

Miss Millie Smith, Texas School for the Blind, Austin, Texas

Dr. Dean W. Tuttle, University of Northern Colorado, Greeley, Colorado

Ms. Rona Willen, Temple University, Philadelphia, Pennsylvania

Publications during FY 1977

- Berla', E. P. Tactual skills in reading embossed displays. In Association for Education of the Visually Handicapped, Fifty-third biennial conference. Philadelphia, Pa.: Association for Education of the Visually Handicapped, 1976. Pp. 115-119.
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## DEPARTMENT OF EDUCATIONAL RESEARCH

### REPORT ON RESEARCH AND DEVELOPMENT ACTIVITIES

FISCAL 1978

This year was an active one and a productive one for the Department of Educational Research. Although the main thrust of the Department's effort was in the development and evaluation of educational materials, more basic research was also conducted in the area of concept development. The activities of the Department were supported through a federal appropriation for educational and technical research and by two separate grants from the Bureau of Education for the Handicapped. These grants provided continuing support for projects in which a Beginning Braille Reading Series is being developed and in which the Utilization of a Low Vision Kit is being revised and expanded. In addition to these, the American Printing House for the Blind's (APH) contract with the Bureau of Education for the Handicapped, under which the Department of Educational Research served as the Special Office for the Visually Impaired, terminated during the year with all objectives being met. These included increasing the number and variety of educational materials available for use with visually handicapped students and the identification and provision of information for entry into the National Materials Information System about more than 12,000 educational materials appropriate for use with visually handicapped students.

Activities related to materials included both those in which needs for materials were identified and those in which the development and evaluation of materials were addressed. In addition to the two federally funded projects mentioned, these later included materials for use with multiply handicapped, visually impaired persons and materials for the academic areas of mathematics, science, and social studies.

A major concern during the year was that of building staff. Recruitment was undertaken and, by the end of the year, arrangements were near finalization for filling all primary staff positions. During FY 1978, as in some previous years, the Department's staff was augmented by the services of other professionals who worked with the research staff in the development of new materials. Additionally, the research intern program was reactivated during the year with one intern serving in it.



Throughout the year input was actively sought from the field to help in the determination and prioritization of needed materials and in the development of the materials themselves. This was accomplished through use of consultants, some of whom were experts in the content areas being addressed and some of whom were knowledgeable educators of the visually handicapped in areas appropriate to the materials under development. In one phase of the evaluation of new materials, experienced teachers were solicited and used as teacher evaluators in order that the materials be critiqued by skilled teachers in actual classroom use.

The year was a positive one. Throughout it the Department's work was enhanced by the professionalism of the people working in it, by the support of the Printing House's leadership and staff, by the many professionals who willingly participated in its projects, by the agencies which made their students available to work in its projects, and by the students themselves who enthusiastically served as subjects in its various undertakings.

### Progress in Specific Research Activities

In this section summary reports will be found indicating work that was done on the various projects during FY 1978 and work that is planned for FY 1979. In each case the project leader responsible, the other research staff, and the "working" consultants who participated in the project are identified. As in other years, Ken Coy, the Educational Materials Development Technician, made contribution to many of the projects.

#### Spatial Concepts Studies

Work completed during FY 1978. Three studies were completed during the FY 1978. The first study, Tactual Discrimination of Household Objects, utilized common household objects to explore the young blind, partially sighted, and sighted child's concept of space. Each child was required to tactually explore a stimulus item representative of objects from one of six rooms in a house. The assessment asked the child to tactually locate the same or similar object from among three alternatives. Results were analyzed with reference to the degree of vision, amount of previous schooling, and sex in terms of three assessment variables: type of identification required (same or similar), room of the house represented (utility including workshop, laundry, sewing, etc.; living room; kitchen; bath; bedroom; playroom), and degree of similarity displayed (very familiar, familiar, or unfamiliar). No differences were obtained between vision, schooling, sex, or familiarity variables. Statistically significant differences were obtained for both identification and room variables. These results suggested that it was easier for subjects to locate an object which was the same as the stimulus than to choose one similar to the stimulus. Differences between room classifications suggested that young children were more familiar with some areas of the home than others. It was suggested that a readiness assessment might include some of these items to assist in determining children whose experiential background might inhibit their progress in formal school programs. This research was conducted by Katherine Simpkins. She was assisted by Mercia Segovia and Julie Jones.

The second study in the series, Tactual Discrimination of Shapes, utilized shapes characterized by topological and Euclidean relations. Subjects were required to examine a stimulus shape tactually and then to locate the same shape from among four alternatives. No significant differences were found for degree of vision (blind, partially sighted, or sighted) or sex (male or female), but school experience (no previous schooling or 1 year of previous schooling) did affect choice. Children with no previous schooling tended to do well on identification of shapes characterized by topological relations while those with 1 year of schooling performed well with those shapes involving curvilinear-rectilinear relationships. The importance of topological relations was supported further when incorrect choices were examined. For all vision categories and for both levels of school experience, topologically similar shapes were chosen more frequently than any of the other options. From the results it was concluded that further study was needed to determine whether early training in exploratory techniques would be useful in training young visually impaired children to isolate distinctive components, discriminate likenesses and differences, and to develop a mental reconstruction of the stimulus. This research was carried out by Katherine Simpkins. Mercia Segovia and Julie Jones assisted her.

The final study in the spatial concepts series, Construction of a Projective Straight Line, investigated the child's shift from topological to projective and Euclidean representations using eight small wooden posts, two small "barns," and two "fields" (rectangular and circular). Each subject was requested to construct with the posts a straight "fence" between the two "barns" which were placed at various positions on the two "fields." Unlike the results with sighted subjects, no differences were found between the ability to construct horizontal and the oblique lines. Although half of the blind subjects were able to successfully complete the tasks, the correct solutions covered a wide age span indicating no chronological progression in the blind sample. Rather, median age was approximately 2 years older than sighted subjects for completion of horizontal lines while median age for oblique lines was 4 to 7 months older than sighted samples. Results suggested that difficulties in developing spatial concepts in blind children become apparent during the transition from topological to projective and Euclidean ideas. Although some subjects had spontaneously developed projective and/or Euclidean techniques for construction of the straight line, half of the blind subjects had not developed them. These findings suggested the need for additional research to determine projective and/or Euclidean techniques appropriate to blind subjects and to develop methods for training these techniques. Katherine Simpkins was the project leader. She was assisted by Anthony Siegel.

#### Sensory Stimulation Kit - Materials for Multihandicapped, Visually Impaired Students

Work completed during FY 1978. Following production approval at the 1977 Annual Meeting, the Sensory Stimulation Kit items, teacher's guidebook, and activity cards were submitted to the APH production department. Research and development staff continued to consult with production personnel throughout the manufacture of the materials. A professional editor prepared the guidebook and activity cards for publication and comprehensive final report was written on the development of the Sensory Stimulation Kit.

All kit items were tested by U.S. Testing Company, Inc. in Hoboken, New Jersey for product safety. The items were tested for conformance to the requirements of Title 16, Chapter II, Federal Hazardous Substances Act Regulations, "Test Methods for Simulating Use and Abuse of Toys, Games and Other Articles Intended for Use by Children." Two modifications were made as a result of the tests performed.

Additional copies were made of the videotape, which illustrates the Sensory materials being used with a multihandicapped visually impaired child and a preschool visually impaired child. A narrative was dubbed onto the tape explaining what the teachers are doing and why. Sheri Bortner was assisted by Sue Simon on this project.

#### Multihandicapped Needs Assessment Meeting

Work completed during FY 1978. A second APH-sponsored multihandicapped needs assessment meeting was held in April 1978. The purposes of the meeting were to:

- define priority areas for materials development
- indicate specific project possibilities within the priority areas
- expand a list of resource people to use as consultants
- expand a list of quality educational programs in which to field test materials
- exchange innovative materials developments in the field
- promote responsiveness to needs and concerns of consumers

Fifteen professionals involved with multihandicapped, visually impaired (MHVI) children were invited to participate in the needs assessment meeting. Participants included teachers, program supervisors, state department consultants, and university professors from various parts of the United States. The criterion used to select participants was direct involvement and expertise in the identification of materials needed for multihandicapped visually impaired children.

Priority areas for educational materials development efforts were determined for the developmentally young MHVI student as well as for the higher functioning MHVI student. Within each priority area, specific materials were suggested. The priority areas identified for developmentally young MHVI child are:

1. Low vision kit
2. Sensory integration
3. Fine motor
4. Self-help
5. Communication
6. Cognitive skills



Priority areas indentified for higher functioning MHVI student follow:

1. Prevocational/work training skills
2. Leisure time use
3. Socialization/human sexuality
4. Self-help
5. Communication
6. Teacher made materials

Sharon Goldblatt assisted Sheri Bortner in organizing this meeting.

#### Sing about Me - Basic Approach to Beginning Language/Auditory and Oral Language Skills

Work completed during FY 1978. The Sing about Me (SAM) materials were field-tested during FY 1978 for a 4 to 6 week period in 25 programs for preschool or MHVI children. Residential, private agency, and public school programs were utilized in various geographic locations throughout the United States for field testing the SAM materials. Both classroom teachers and music specialists evaluated the songs. The field test data were compiled and analyzed to determine necessary revisions in areas such as tempo, word content, rhythm, melody, key, voice clarity, instrumental quality, and relevance in promoting language development. Improvements needed in the guidebook and activity cards were also determined from the evaluations completed by the field testers. After all revisions had been identified, a search was made for a professional recording artist of music for young children. A well-known children's recording artist agreed to make the relatively extensive revisions for a reasonable price, but later had to rescind because of ill health. The project was terminated because of the number of revisions needed, the availability of recordings for young children, and the lack of technical expertise needed for recordings of this type of APH staff. Sue Simon assisted Sheri Bortner on this project.

#### Materials for Motor Skill Development - Fine Motor Manipulative Materials

Work completed during FY 1978. The purpose of the motor skills project is to develop fine motor manipulatives and prevocational manipulative training materials for MHVI students. To assist in developing the fine motor materials, a literature review was conducted. Developmental sequence norms for the acquisition of motor skills were reviewed and compiled. Curriculum materials in the fine motor area were examined. A commercial materials search was conducted and analyzed by an in-house committee. It was determined that the commercially available Activity Center provided a great deal of practice in the fine motor manipulative skill area. The Activity Center (Fischer-Price) and the Busy Box (Gabriel) were consequently modified to make them more tactually, visually, and auditorily interesting. The adapted materials were designed to provide the lower functioning child with an opportunity to develop a pincer grasp, palmar grasp, reaching, cause-effect relationships, eye-hand coordination, muscle strength, and visual/auditory/tactual stimulation. The adapted materials were tested in a formative evaluation. Through analyzing the child and teacher data, it was determined that the items on the adapted materials

were too close together and consequently confusing to many MHVI students. Skill areas most needed by the MHVI students in obtaining fine motor competency were analyzed. An APH designed activity board was initiated as an alternative to the Fischer-Price and Gabriel models. The services of an industrial/educational materials designer were utilized.

The APH Activity Center is composed of eight fine motor activity units which combine to make four modular components. A component of two activity units measuring 5 x 10 inches (12.7 x 25.4 cm) can be presented, or the total of eight units, measuring 20 x 40 inches (50.8 x 101.6 cm). Trays are provided which allow for combining the activity units in sets of two. Activity units are:

1. a. Tomato to push in/pull out (interchangeable)  
b. Dog squeaker (interchangeable)
2. a. Paper roll for turning  
b. Ribbed writing surface
3. a. Three-tiered spinner  
b. Tactile box with door (interchangeable)
4. a. Tambourine with turn knob  
b. Cage with bells

Along with the adapted Activity Center and Busy Box, four commercial materials were formatively evaluated with consideration of potential modification for the MHVI child. The teachers involved in the testing were enthusiastic about these manipulative materials, so plans were made to modify them and mount them on wooden trays that would be convenient for storage. The manipulatives consist of five stackable units, each presenting materials for the development of fine motor skills. The five items presented are:

1. Spinners - presenting varying degrees of difficulty in turning, also brightly colored and patterned
2. Cogs - bright colored plastic "wheel" cogs that turn via a knob
3. Track - allows knob to move in circular, horizontal, and vertical positions
4. Chimes - colorful wheels mounted to produce a "chime" sound when rotated; three different sounds can be produced
5. Springs - brightly colored wooden balls secured to a wooden dome by springs

Each unit is contained within a wooden tray, designed for vertical stacking. The units measure approximately 10 x 12 inches (25.4 x 30.5 cm) each.

Both the APH Activity Center and the five stackable manipulatives were field-tested with preschool and MHVI children. Revisions were made based on teacher evaluations and child data. Data collected included information on success in manipulation, effectiveness of manipulation, relative interest to other fine motor materials, accompanying materials and activity cards, potential usefulness, durability, and safety of the materials.

Work planned for FY 1979. Two specimen models will be prepared for the production department. Accompanying written materials will be submitted to a professional editor. A final report will be written on the development

of the fine motor skill materials. All fine motor manipulative materials will be evaluated by the U.S. Testing Company, Inc. for product safety prior to entering the APH production pipeline. Sheri Bortner was assisted by Suzette Frere in this project.

#### Materials for Motor Skill Development - Prevocational Skills Development

Work completed during FY 1978. The development of prevocational materials for higher functioning MHVI students was deemed first priority by a needs assessment conducted by APH in April 1978. A committee meeting of seven regional deaf-blind center prevocational consultants was held in Los Angeles in May 1978, in conjunction with a national deaf-blind exchange session. The purpose of the meeting was to determine materials needed to accomplish skills deemed necessary for a prevocational MHVI student. Skills were identified.

Work planned for FY 1979. A literature review will be conducted in the area of prevocational skills for the MHVI child. Curriculum and program models also will be reviewed for applicable material. Several programs with exemplary prevocational programs will be visited.

Construction of the seven prototype prevocational materials determined by the committee will be initiated. A list of the materials to be developed and a brief explanation of their use follows:

1. Folding jig - To assist the MHVI student in folding letters to fit into envelopes. The paper is inserted and metal flaps on hinges fold over to crease the letter into three parts.
2. Container lids/tops - Two sets of container/jars are mounted onto a board. One set will require the student to screw the lids onto the jar; the other set will require a push down/pull off motion. Jars/containers will be graduated from a 1/2 turn to several turns.
3. Tray - For assembling, sorting, and matching tasks. Removable dividers inside the tray allow for various sized vertical and horizontal compartments.
4. Assembly materials - 100 pens will be provided for practice in a simple assembly task.
5. Stanley tool kit - The beginning carpenter's set will be included.
6. Supplemental materials - Apparatus will have a suggested sequence for presentation, determined by field testing. Brief comments on the presentation and use of each item will be included. References for additional prevocational materials, assembly tasks, programs, written materials, and other resources will be included.



Following the development of the prototypic materials, accompanying written materials will be prepared. An in-house committee meeting will be held to determine procedures for the formative evaluation. The materials will undergo expert review and then revision, following the formative evaluation. Eight sets of the seven models will be prepared for field testing.

Students who have acquired basic language, motor and self-help skills, will be involved in testing the prevocational materials. Field testing sites will include schools for the blind, public schools, and private agency programs. Six to eight sites will participate in the field testing, involving a total of 50-60 MHVI students. Teachers using the materials will be asked to complete comprehensive evaluation forms that will be used to document the effectiveness and quality of the prevocational materials. Data collected will include information on the manipulability of the prevocational materials, durability, safety, interest level of the students relative to similar materials, effectiveness in teaching identified skills, and the value and extent of accompanying written materials. Both the tangible apparatus and the accompanying written materials will be critiqued by the field test teachers. APH staff will introduce the materials to the teachers and explain testing procedures and evaluations to be completed. Staff from APH will observe several of the programs while the materials are being used with students. Revisions will be made, based on the compilation of the field testing data. Suzette Frere and Bill Duckworth will assist Sheri Bortner on this project.

#### Early Childhood/Preschool Needs Assessment Meeting

Work planned for FY 1979. APH will conduct a needs assessment meeting in February 1979 to determine materials development priorities for infant and preschool visually impaired children. The target population will be the blind child without additional handicaps. Professionals across the United States actively working with infant and preschool visually impaired children will serve as consultants for the needs assessment. The meeting will accomplish the following:

- define priority areas for materials development
- indicate specific project possibilities within the priority areas
- exchange innovative materials developments in the field
- expand a list of resource people to use as consultants
- expand a list of quality educational programs in which to field test materials

Sheri Bortner will be responsible for this meeting.

#### Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students (0-36 months)

Work planned for FY 1979. A needs assessment meeting concerning materials for MHVI students was conducted at APH in April 1978. For the developmentally young MHVI student, a kit of vision stimulation materials, both commercial and APH developed. A collection of vision stimulation materials was suggested because of the variance in ability and functional levels of the MHVI population. The kit items, with accompanying activity

cards and visual developmental information, will assist MHVI students in learning to use their residual vision. Accompanying written materials will include suggested activities for using each kit item and other related reference materials.

Literature and curriculum reviews will be initiated in the areas of vision stimulation and visual development for low functioning or developmentally young students. Several program reviews and visitations will be made to schools including vision training or their curriculum for developmentally young students. A search will be made of commercial materials that are highly interesting visually. A committee of professionals with expertise and experience in low vision training for the low functioning child will serve as consultants.

Subjects utilized in the formative testing will be MHVI with an overall functional level of birth to 36 months. Students will be from residential schools for the blind, private agencies, and public school programs. An attempt will be made to include a variety of program types, such as center-based, home-based, and so on. Sites will be selected with competent teachers who are motivated to provide their students with vision stimulation experiences.

Committee members will be involved in developing the activities and related materials to be included in the kit. Teacher critiques will be used in the formative testing to gain evaluative information for revisions. Information will be elicited concerning the developmental level for which the materials are most appropriate; vision stimulation materials currently used; the relative interest level of the materials for the children; ratings for each material; improvements to be incorporated into the revision of the materials; suggestions for additional items and related written material; durability, construction, and safety of the materials; and so on. The collection of limited child data will also be incorporated into the teacher evaluation. The prototype materials will also undergo expert review. Sheri Bortner and Amie Dennison will be assisted by Suzette Frere.

#### Revision of the Utilization of Low Vision Kit

The purpose of this project is indicated in its title. However, because of the extensiveness of the revision, the set of materials that is evolving has been renamed and is now being called the "Program to Develop Efficiency in Visual Functioning." The components of the program have been specified and include:

Theme and Organization of Complete Program - this will provide an introduction and overview of the program

Diagnostic Assessment Procedure - this will include instructions for administering the procedure, approximately 40 assessment items interfaced with the lessons, and all materials needed for use with the assessment items

Design for Instructional Plan - this will include basic information essential for implementation of the training program and approximately 150 lessons sequenced in accordance with normal visual development and print materials required with the lessons

Supplemental Source Book - this will include lists of materials that can be used with the lessons, a glossary, a bibliography, and sections pertinent to the use of vision, but nonessential for implementation of the program (e.g., major eye conditions and their influence on visual functioning, magnification and low vision aids, illumination and visibility factors, etc.)

Work completed during FY 1978. Early in the year initial drafts of all materials except the Supplemental Source Book were completed and to some extent refined; and, the tangible and graphic materials needed for use with the assessment procedure were identified. Sets of these materials were sent to the project's 14 consultants for independent expert review. Subsequent to tabulation of the results, the consultants met with the project staff to arrive at a consensus regarding matters about which review information was ambiguous. By the end of the year the Diagnostic Assessment Procedure had been modified accordingly and its evaluation planned.

Work planned for FY 1979. Several phases of the work will be going on simultaneously during the year. The Diagnostic Assessment Procedure will be subjected to two levels of evaluation. One will be through a subjective critique in use by five of the project's consultants who are experienced in evaluating visual functioning, and the other will be through an empirical evaluation of the instrument's reliability. Approximately 130 legally blind students, 100 from public schools and 30 from residential schools for the blind, will be included in the later. Thirteen teachers from nine states and Canada will administer the procedure to approximately 10 students each after having been trained in use of the assessment procedure at a workshop conducted by project staff. Following analyses of the data, necessary revisions will be made in the assessment procedure. Simultaneously, work will be underway on the other components of the program. Initially, the first draft of the Supplemental Source Book will be completed and sent to six of the project's consultants for review. Subsequently, it will be revised as needed. The remaining two components of the program will be modified as indicated in their FY 1978 review. All materials are to be placed in the field for a full field evaluation during FY 1980. Planning for this evaluation will be completed during FY 1979. Project staff has included Natalie Barraga (the originator of the original kit) and her staff at the University of Texas (Austin) and June Morris, Amie Dennison, and Debbie Willis of the Printing House staff. These later will be joined by Ed Berla in FY 1979, who will be responsible for the evaluation of the materials.

### Beginning Braille Reading Series

Research completed during FY 1978. The project to develop a Beginning Braille Reading Series was a 3 year project which was initiated in September 1975 and completed in August 1978. The major objective of the project was to develop a set of braille reading materials designed to over-



come, or minimize, many of the problems encountered by children who must learn to read using the braille code. The entire set of materials consists of a transition level reader, three preprimers, one primer, and a first, second, and third grade reader. Each of these readers is accompanied by a teachers' guide and a set of consumable worksheets, with the exception of the transition level reader which is a consumable text and has no worksheets.

The 1st year of the project was spent in conducting a thorough review of research in the areas of braille reading, tactual perception, concept development in blind children, and general reading; and in the development of a detailed set of specifications for writing the series which was based on this review. These specifications were then given to a consulting editor with extensive experience in writing children's reading materials, who was responsible for the actual writing of the braille reading materials.

During the 2nd year of the project (FY 1977) the writing of the transition level reader, the three preprimers, and the primer and their accompanying materials was completed, and during the 3rd year (FY 1978) the first, second, and third grade readers and their accompanying materials were written.

The evaluation phase of the project was begun in the 2nd year of the project and has been ongoing. This phase consisted of placing each level of the series in the field with a group of students who have progressed through the series at normal pace. As the materials were used in this way, teachers evaluated them by collecting data on the children and by completing evaluation forms as each level was completed.

Throughout the 3-year period, the project staff was assisted by a consulting committee of experts in braille reading and general reading who reviewed all materials as they were developed and made recommendations for revisions. These recommendations were used in conjunction with the evaluation data to make final revisions on each level of the series when all students in the field trial had completed a level.

At the present time, all students have completed the transition level reader and the final revisions have been made. Procedures have begun on this level for preparation of the final production copy. Revisions of the other levels of the series have not begun because all students in the field trial have not completed the preprimer level materials. Hilda Caton, Eleanor Pester, and Sharon Goldblatt have been responsible for this project. Eddy Jo Bradley has served as the Directing Editor.

Work planned for FY 1979. Plans are now being made and a new proposal is being written for the continuation of the field evaluation and revisions of the preprimers, primer, first, second, and third grade materials. It is anticipated that the completion of these activities will take approximately 3 years. The actual production of the materials is scheduled so that the beginning levels - transition level, preprimer, and primer - will be produced during FY 1979 and the remaining levels will be produced in subsequent years as the field trials and revisions are complete. The production will be scheduled so that each level of the series will be available as students need it. Hilda Caton and Eleanor Pester will be responsible for this phase of the project. Eddy Jo Bradley, the Directing Editor, and her staff will continue working on the project.

### Criterion Referenced Tests for Beginning Braille Reading Series

Research completed during FY 1978. During the FY 1978 a project was initiated to develop a set of criterion referenced tests to accompany the Beginning Braille Reading Series. A set of tests was needed for this program because the unique presentation of the braille in the reading series made standardized tests inappropriate. The basic objective of this project is to develop six tests to accompany each of the following levels: transition level reader, preprimers, primer, first grade reader, second grade reader, and third grade reader.

The test for each level was developed as the readers were written. Item trials were conducted as students in the field trial completed each level. Final editions of tests will be produced with each level of the reading series.

Dr. Earl Rankin, of the University of Kentucky, has been responsible for the designing of the tests at each level and APH project personnel have been responsible for the writing of the items. This project was directed by Hilda Caton who was assisted by Eleanor Pester and Sharon Goldblatt.

Work planned for FY 1979. Beginning with FY 1979, this project will be combined with the Beginning Braille Reading Project. During the next 3 years, data from the field trials of the items will be analyzed as students complete each level and are tested. Following this, final items will be selected and final editions of tests for the completed levels of the series will be prepared for production. Hilda Caton and Eleanor Pester will be responsible for this work.

### Planning Institute - Braille Textbook/Workbook Formats

Work conducted during FY 1978. Because of problems visually impaired children encounter in using reading textbooks and workbooks transcribed directly into braille, an institute to investigate those problems more fully was planned for FY 1978. It was anticipated that participants in this institute would: (1) identify problems encountered by visually impaired children in using braille reading textbooks and workbook materials in their present format, (2) make recommendations related to more appropriate formats, and (3) specify the role APH could most effectively play in implementing those recommendations.

It was not possible, however, to hold this institute as planned. This was primarily due to the fact that APH staff personnel were not available at this time to direct and conduct the institute and subsequent project activities which may have been recommended. Therefore, the institute has been delayed until personnel are available to plan and conduct it. A definite date for the institute has not been set.

## Educational Games

Work conducted during FY 1978. The purpose of this project is to provide educational games for young, visually handicapped children that can be played with their sighted peers. During this year two adaptations of the games Silly Sandwich and Sneaky Snake were field-tested for legibility with individual blind children ages 4-7 years old. Results of this testing showed that one of the adaptations of Silly Sandwich could be used successfully with blind 6 and 7 year olds with only a few minor revisions. Neither of the two adaptations of Sneaky Snake proved to be successful. In addition to the adaptations of these two games, field testing was also done on two braille dice and on three large print dice for legibility and on eight tactile game tokens for discriminability. The most successful of these dice and tokens will not only be used to adapt Silly Sandwich and Sneaky Snake, but will also be used in the proposed game kit for the visually handicapped. A tentative list of commercial games which would require little or no adaptation for use with the visually handicapped has been compiled and suggestions for simple adaptations will be made utilizing the game kit when it is available. Eleanor Pester was assisted by Debbie Willis and Suzette Frere on this project.

Work planned for FY 1979. There are three major objectives for the next year of this project. The first is to field test Silly Sandwich in revised form with pairs of children with varying degrees of vision. Next, Sneaky Snake will be redesigned and field-tested with individual visually handicapped children and with pairs of children with varying degrees of vision. Third, the game kit will be completed. This will require a tactile spinner and assembling and placing the kit in the field for use with visually handicapped children and expert reviewers. Debbie Willis and Tony Siegel will assist Eleanor Pester on this project.

## Tactile Display Kit

Work completed during FY 1978. In initiating work on the Tactile Display Kit, all pertinent literature was reviewed and conferences were held with various persons concerned with tactile graphics in order to become better acquainted with the needs for such a kit and the problems involved in its preparation. Sample materials were collected and experimentation was conducted in the Department's model shop to test available materials and to determine their versatility. Additionally, site visits were made to several agencies whose work in tactile graphics had received acclaim to collect information about the materials and procedures used. Katherine Simpkins was responsible for the compilation of this information. She was assisted by Anthony Siegel.

Work planned for FY 1979. Information acquired will be used in determining specifications for a Tactile Display Kit. When this kit is assembled it will include a manual for teachers to show them how to apply the results of research to train students to read tactile maps and diagrams more efficiently as well as providing information for design of their own tactile graphics. With the manual will be symbolic materials which can be used in the preparation of tactile displays. After developing the prototype for such a kit, it will be placed in the field for evaluation. Due to a change in staff, work on this project will be continued by John Barth. He will be assisted by Anthony Siegel and Ed Berla'.



### Continental Relief Map Cassette Program

Work completed during FY 1978. Raised line drawings of maps included in braille social studies textbooks and atlases are inadequate for introducing and teaching a number of geographical concepts in social studies. In an effort to facilitate map study and to improve geographical concepts, the APH developed six simplified continental relief maps on which critical geographical features were found to be highly discriminable by blind students as early as the primary grades. More recently the APH has undertaken the development of audio-tutorial cassette tapes for use as supplementary/reference materials in social studies. These materials were developed to provide supplementary self-instructional materials for blind students in social studies which:

1. Stimulate student interest in map study
2. Motivate blind students in doing reference and library study
3. Encourage blind students to relate social studies content to specific continents through the use of the simplified relief maps

Three tapes will be developed to accompany each relief map; North America, South America, Europe, Asia, Africa, and Australia. The first tape in each series will include an introduction and provide a guide for the tactual exploration of the continent. The script will review basic landform terms and will relate them to actual features on the earth's surface. The first tape will focus on specific features on the earth's surface. The second tape will focus on specific features of that continent, naming some of the important rivers, lakes, mountains, and other pertinent geographic features. The third tape in the series will include socio-historical information such as where people live now, original patterns of settlement, location of important cities on the continent, and significant historic sites. Each tape will be from 20-30 minutes in length. Scripts for three cassette tapes each for North America, South America, and Europe have been completed.

Work planned for FY 1979. The tapes for North America, South America, and Europe will be evaluated. The evaluation will include expert reviews, teacher critiques and interviews, and an empirical evaluation of student use.

Six content experts in geographic and/or social studies education will review the (nine) tapes for North America, South America, and Europe to determine their accuracy and appropriateness as supplementary social studies materials. Each reviewer will receive script copies and appropriate simplified continental relief maps.

Six to eight elementary grade social studies teachers who use the tapes with braille and large print students will critique the materials:

1. To learn if students can use the introductory tape (Tape 1) to locate critical geographical features on each map
2. To observe whether students can follow instructions which are included in the program (Tapes 1, 2, and 3)
3. To appraise the usability of the materials by blind students in social studies

4. To make suggestions for their use as supplementary social studies materials

Tapes for Asia, Africa, and Australia will be prepared by Jack Miller, George Peabody College for Teachers, Nashville, Tennessee. He will follow procedures used in preparing tapes for North America, South America, and Europe.

These projects are co-directed by Frank Franks and Jack Miller. They are assisted by Anthony Siegel.

#### Metric Measurement Materials and Aids

Work completed during FY 1978. The metric measurement readiness program was designed to introduce basic measurement operations in linear measurement, volume, and mass/weight. The scope of the program includes the development of instructional materials that (a) provide prenumber measurement activities, (b) utilize basic number concepts taught by the teacher, and (c) combine the two to introduce number measurement. The activities emphasize prenumber measurement experiences that will provide background for the higher degree of abstraction required for measurement using numbers. Process related activities in classifying, comparing, ordering, and measuring are integral components of the instructional program.

Twelve teachers (9 from public schools and 3 from residential schools) critiqued the linear measurement section of the metric measurement program using more than 60 visually handicapped students from grades K-6. Results indicated that the materials were appropriate for the initial target group (grades 3-6) and could be used successfully with younger and older students with some adaptations and additions.

This project was directed by Frank Franks with assistance from Debbie Willis and Bob Glass. The materials were developed with assistance from LaRhea Sanford and Tuck Tinsley III of the Florida School for the Deaf and the Blind.

Work planned for FY 1979. The volume/capacity section of the metric measurement program will be evaluated by teachers who will use the program with elementary grade students (grades K-6). The evaluation will focus on the usability of the materials and on the appropriateness of the program for visually handicapped students.

Formative evaluation of the mass/weight section is in process and plans are to evaluate this program later in the year. Evaluation of the three sections (linear measurement, volume/capacity, and mass/weight) will complete the metric measurement readiness project. This project is directed by Frank Franks who is assisted by Bob Glass and Debbie Willis. The APH project staff will be assisted in development of the program by LaRhea Sanford, Tuck Tinsley III, and Sandra Albrect of the Florida School for the Deaf and the Blind.

### Two- and Three-Dimensional Relationships in Mathematics

Work completed during FY 1978. Two aids have been developed, legibility testing of the basic aid parts has been completed, and activities for a manual for demonstration/illustration of spatial concepts have been drafted and have received formative evaluation. The two aids are: A two-dimensional board and manual to introduce two-dimensional spatial relationships to young blind students, and a three-dimensional board and manual for demonstrating/illustrating three-dimensional concepts to older blind students.

These two aids with manuals have been developed for use in introducing/illustrating/demonstrating a broad range of spatial concepts to blind students (grades K-12) utilizing a hands-on approach. Students can progress from two-dimensional to three-dimensional relationships using the materials. The two-dimensional aid consists of a square board with regularly spaced holes (five units in each direction from the origin) connected by grooves. The student can move forward, backward, left, or right on it by counting spaces and moving pegs from hole to hole to perform a number of spatial activities.

The three-dimensional board with the same dimensions as the two-dimensional board (plane) is mounted five units above a base. The three-dimensional board extends five units horizontally and provides point markers for locating points from one to five units vertically. Horizontal positive and negative points in space are marked by pegs in the appropriate unit hole from the origin. Points in the vertical dimension are indicated in the appropriate units by point markers which are from one to five units in length. Positive points in space are indicated above the board and negative units are indicated below the board.

Work planned during FY 1979. The principal objective of this project in FY 1979 is to have the two manuals reviewed by teachers of blind students to determine the appropriateness of the materials for demonstrating/illustrating spatial concepts to blind students. Field evaluation of the aid will consist of reviews by teachers who will use the aids and the manuals with blind students. Eight math teachers will participate. The teacher review form provides for responses on spatial concepts, demonstration activities, vocabulary/equipment, and activities instructions. This project has been directed by Frank Franks, working closely with Tuck Tinsley III, Florida School for the Deaf and the Blind, and Anthony Evancic, Western Pennsylvania School for Blind Children. He is assisted by Bob Glass.

### APH Student Speech Plus Meeting

Work completed during FY 1978. In November 1977, 14 participants representing general and special education, teacher education, industry, the California Clearinghouse Depository for Handicapped Students, and the APH met in San Francisco to explore types of materials needed by blind students for understanding calculator applications. Immediate needs for



materials recommended by participants included a minimum of three sets of materials:

1. Materials to introduce the APH calculator to primary-elementary grade visually handicapped students
2. Workbook practice materials which focus on computation for elementary grade students
3. More advanced materials which emphasize problem solving for upper elementary, junior high, and secondary students

Frank Franks represented APH at this meeting and compiled the findings.

### APH Student Speech Plus Materials

Work completed during FY 1978. Computation and Problem Solving for Young Adults was a response to recommendation 3 and is now available for secondary and vocational students. This manual is a self-instructional program independent of textbook instruction. The content and its presentation make this publication suitable for students as early as junior high school. Students in vocational and rehabilitation programs may find it invaluable because of its focus on daily living and on real life problems.

The content is presented in a simple, direct format which focuses on computation and problem solving. Generally, each lesson presents computation exercises and is followed by "word problems" which employ operations from the computation exercises in their solution. The problem solving exercises are more oriented to daily living and to real life situations than to stereotyped word problems traditionally found in mathematics textbooks.

This calculator program was written by William E. Lamon, mathematics professor, University of Oregon, Eugene; by Anthony Evancic, mathematics teacher, Western Pennsylvania School for Blind Children, and by Tuck Tinsley III, mathematics teacher, Florida School for the Deaf and the Blind.

Work to be completed in FY 1979. The immediate need (as expressed in recommendations 2 and 3 from the needs meeting) is for practice materials which focus on computation for elementary grade students and materials which emphasize problem solving for older students. These students often are mainstreamed into classes where the calculator is used as a standard mathematics aid.

The principal objective of this project is the development of computation and problem solving activities designed to provide the younger blind student with practice materials to facilitate his independent use of the calculator (a) in performing fundamental operations (computation) and (b) in solving problems that appear in mathematics textbooks.

Two volumes of practice materials will be developed. The first volume will emphasize fundamental operations in computation. Representative numerical exercises will appear in each lesson. These will be followed by verbal presentation of numbers in simple word problems. A considerable portion of the first volume will be devoted to introduction to and use of

the calculator. This volume can be used with students as early as the fourth grade.

The second volume will focus on problem solving activities. "Criterion" activities from the first volume will introduce each lesson. If the student can perform these tasks with ease, he can continue the lesson. If for some reason he has difficulty, he should return to the appropriate section in the first volume. Representative problems will be included and a substantial number of the problems will be oriented to real life situations. When a student has successfully completed the first volume, he may proceed to the second volume. (This volume will include problems suitable for general math students and for students in vocational mathematics at the senior high school level).

These two volumes with Computation and Problem Solving for Young Adults (1978) co-authored by Lamon, Evancic, and Tinsley, will provide a sequential calculator program for remedial and general math students through the secondary level and for students in vocational programs below the college level.

The general format for each lesson will include an example for the student to work through, step by step, with the answer given. This format follows that successfully used in Computation and Problem Solving for Young Adults (1978). To simplify student use, the answer will immediately follow each problem. Students will not be required to go to the end of the lesson to find answers. These manuals will be drafted by Anthony Evancic, of the Western Pennsylvania School for Blind Children, Tuck Tinsley III of the Florida School for the Deaf and the Blind, and Bob Glass of APH. Frank Franks will direct the project.

#### APH Student Speech Plus Calculator: A Market Study

Work planned for FY 1979. The APH Student Speech Plus calculator, a special version of the Speech Plus<sup>TM</sup> calculator developed by Telesensory Systems, Inc., became available from the American Printing House for the Blind during the fall of 1977. In order to follow up on its use, a market study will be conducted to learn (a) of needed design modifications or extensions that would make it more suitable for educational purposes, (b) of innovative uses, and (c) if additional training materials to those described in the previous section are needed. A questionnaire will be sent to individuals and institutions having purchased one or more calculators prior to August 1, 1978, addressing the above issues. Also, a selective telephone interview will be conducted as a follow-up. The information obtained will be used in the determination of specifications for future calculators and additional instructional materials. Debbie Willis, assisted by June Morris, will conduct the market study.

#### Materials Needs Meeting - Mathematics

Work planned for FY 1979. A meeting will be held in April 1979 in conjunction with the National Council of Teachers of Mathematics' meeting between "expert" mathematicians and experienced math teachers of the visually handicapped in order to identify the direction in which math curricula are headed and to determine the types of math materials that will be needed by

visually handicapped students in the near future. Once identified, the needs for such materials will be prioritized. Frank Franks will be responsible for this assessment of these needs.

#### Biological Models Development in Cell Division: Mitosis and Meiosis

Worked completed during FY 1978. The APH has developed a number of biological models during the past 5 years. These models are tactile schematics in relief which present organizational plans of various plant and animal cells and structures. The materials were designed for the classroom and have enjoyed wide use throughout the United States.

A set of seven mitosis models, each depicting a phase of mitosis, and accompanying written materials, were developed in FY 1978. The models were tested for legibility and the mitotic features were found to be highly discriminable. The models emphasize simplicity, but offer additional cues where complexity occurs. Texture, size, shape, and relief were used for maximum legibility. Chromatic color coding was employed to maximize color and luminance contrasts for low vision students. The materials are ready for further adaptation for evaluation as a reference/supplementary set of biology aids. This work was done by Frank Franks, Ruth Gough of Henderson Community College, and Rebecca Hunton of the Indiana School for the Blind. The APH research assistant to the project was Anthony Siegel.

Work planned for FY 1979. There is a need for audio-tutorial supplementary and reference materials which blind and visually handicapped students can use without teacher assistance in the rapid-paced mainstream. It is the purpose of this project to adapt the mitosis materials for use as a self-instructional reference program. The project will utilize the mitosis materials which consist of seven models - each depicting a mitotic phase - and the accompanying written materials to develop the self-instructional program. The written materials will be reviewed and edited by project staff to develop scripts for independent use with each model. The scripts will be recorded by professional readers in the APH recording studio. A vocally-separate tape.

Evaluation will consist of critiques by biology teachers whose students use the materials and by the biology students themselves to determine the appropriateness of the program as a supplementary/reference aid to instruction. Periodic personal interviews and observations will be made by project staff. A final interview of participating teachers and students will be conducted as a final step in the evaluation. The scripts will be reviewed by prominent science educators for content and for vocabulary/reading level. The project will result in an audio-tutorial set of materials which can be used as a model for development of self-instructional materials for use by blind and visually handicapped students in secondary science.

Also in development FY 1979 will be a set of meiosis models. The development of these models will follow procedures used in developing and evaluating the mitosis models. Content material describing the major events in each phase will be prepared.



These projects will be completed by Frank Franks, Ruth Gough, and Rebecca Hunton. Anthony Siegel will be the APH research assistant assigned to the project.

#### Materials Needs Meeting - Science

Work planned for FY 1979. In March 1979 a meeting will be held in conjunction with the meeting of the National Science Teachers Association as one step in attempting to identify materials that are most needed by visually handicapped students enrolled in science classes. Frank Franks will be responsible for bringing together a group of "expert" science teachers and experienced science teachers of visually handicapped students in order that they be able to interact as they address this issue.

#### Recorded References for the Visually Impaired and Other Handicapped

Work planned for FY 1979. For some years APH worked to develop the technology needed to record, and provide for indexing, reference materials. This technology will now be applied to the recording of the 1979 edition of The World Book Encyclopedia. Permission to record this reference work has been received and the editors of World Book have agreed to act as advisors to the project. Prior to recording, the text of the encyclopedia will be edited so that most charts, diagrams, etc. can be expressed verbally and so that information contained solely in picture captions will be integrated into the text. The edited text will be read by professional readers in the Talking Book studios at APH.

The package for the recorded encyclopedia will consist of a special player and 42 volumes containing the cassettes and indexes in braille and large type. Indexes will be tabbed for each cassette for ease of search, and volumes will be identified alphabetically in both braille and large type. The special four-track player needed for the system will utilize a special cassette deck in which all functions are accomplished electronically rather than mechanically. Sharon Goldblatt and an assistant will be responsible for the preparation of the materials to be recorded and for the overall monitoring of the project. Work on it will be supported through a grant awarded by the Bureau of Education for the Handicapped.

#### Adaptation of Educational Measures

Work planned for FY 1979. APH has been publishing academic tests for visually handicapped students since around 1920. Rather than developing new tests, it has been found to be more economical, efficient, and effective to adapt print tests. During the year an attempt will be made to identify those academic tests that are most widely used throughout the country so that they can be adapted and made available for use with visually handicapped students. These efforts will include working with major publishers of academic tests and a test advisory group. A meeting tentatively planned with such a group during FY 1978 was delayed due to a shift in staff responsibilities. Once needs are identified and prioritized, adaptation will be initiated. Bill Duckworth, who will join the research staff in FY 1979, will be responsible for this work.

Research and Development Personnel for FY 1978

Anderson, Diane - Secretary

Bortner, Sheri, MS - Research Scientist

Caton, Hilda, EdD - Research Scientist (part time)

Coy, Ken - Educational Materials Development Technician (part time)

Dennison, Amie, MA - Librarian and Research Associate (part time)

Franks, Frank, EdD - Research Scientist

Frere, Suzette, BA - Research Assistant

Glass, Robert, BS - Research Assistant

Goldblatt, Sharon, BS - Research Assistant

Jones, Julie, doctoral candidate - Research Intern (3 months)

Morris, June, MA - Acting Director

Moseley, Jan, MA - Research Assistant (part time)

Pester, Eleanor, MS - Research Associate

Segovia, Mercia, doctoral candidate - Research Assistant (part time)

Shapiro, Ellen - MEd - Research Assistant (part time)

Siegel, Anthony, BA - Research Assistant

Simon, Sue, MA - Research Assistant

Simpkins, Katherine, PhD - Research Scientist

Willis, Deborah Hill, BA - Research Assistant

Wingfield, Deborah - Library Clerk

Agencies Participating in Research during FY 1978

This year, as in previous years, many individuals, many schools, and many agencies from throughout the United States have made possible the work of the Department of Educational Research by willingly and graciously cooperating with its research endeavors. Without this help it would not be possible for the Printing House to maintain its ongoing research program. During this year the staffs and students of the following schools and agencies have participated in the research and evaluation phases of the efforts described in this report:

Alabama Institute for the Deaf and the Blind; Talladega  
Arkansas School for the Blind; Little Rock  
Broadleigh School; Columbus, Ohio  
Butterfield School; Lombard, Illinois  
Churchill Park Public School; Louisville, Kentucky  
Cleveland Public Schools; Cleveland, Ohio  
Columbus Public Schools; Columbus, Nebraska  
Dayton Public Schools; Dayton, Ohio  
Dearborn Heights School; Oak Lawn, Illinois  
DeKalb County Schools; Scottdale, Georgia  
Florida School for the Deaf and the Blind; St. Augustine  
Frances Blend School; Los Angeles, California  
Georgia Academy for the Blind; Macon  
Harris-Hillman Public School; Nashville, Tennessee  
Hope School; Springfield, Illinois  
Indiana School for the Blind; Indianapolis  
Iowa School for the Blind; Vinton  
Jackson Public Schools Early Development Program; Jackson, Mississippi  
Johnson Elementary School; Denver, Colorado  
Kansas State School for the Visually Handicapped; Kansas City  
Kennedy Elementary School; Medford, Massachusetts  
Kentucky School for the Blind; Louisville  
Lakeview Jr. High School; Downers Grove, Illinois  
Laurel Ridge School; Decatur, Georgia  
Lincoln Public Schools; Lincoln, Nebraska  
Louisiana School for the Blind (Government Street); Baton Rouge  
Louisiana School for the Blind (Southern University); Baton Rouge  
LSU Medical Center, Developmental Disabilities Center; New Orleans,  
Louisiana  
Michigan School for the Blind; Lansing  
Mississippi School for the Blind; Jackson  
Missouri School for the Blind; St. Louis  
Montgomery County Public Schools; Montgomery County, Maryland  
Nebraska School for the Visually Handicapped; Nebraska City  
NEGA CESA; Winterville, Georgia  
New Jersey Commission for the Blind; Newark, New Jersey  
Omaha Public Schools; Omaha, Nebraska  
Overbrook School for the Blind; Philadelphia, Pennsylvania  
Pasadena Unified School District; Pasadena, California  
Philadelphia Public Schools; Philadelphia, Pennsylvania



Rehoboth Beach Public Schools; Rehoboth Beach, Delaware  
Ross School; San Diego, California  
Rupley School; Elk Grove Village, Illinois  
Special School District of St. Louis; St. Louis County, Missouri  
St. Lucy's Day School for the Blind; Philadelphia, Pennsylvania  
Tennessee School for the Blind; Nashville  
The Governor Morehead School; Raleigh, North Carolina  
Traverse Bay Intermediate School District; Traverse City, Michigan  
Tyler Elementary School; Washington, D. C.  
Variety Club for Blind Babies; San Francisco, California  
Western Pennsylvania School for Blind Children; Pittsburgh  
West Suburban Association; Lombard, Illinois  
Wilmington Public Schools; Wilmington, Delaware

Consultants during FY 1978

APH Student Speech Plus Calculator Meeting

- Ms. Sue Benton, Resource Teacher, Lawton Elementary School, San Francisco, California
- Ms. Gayle Brugler, Training Program Coordinator, Telesensory Systems, Inc., Palo Alto, California
- Mr. Bob Gowan, Itinerant Teacher, San Mateo County Schools, Redwood City, California
- Dr. Phil Hatlen, San Francisco State University, San Francisco, California
- Mr. Tom Kellis, Resource Teacher, Berkeley High School, Berkeley, California
- Mr. Arthur Kessner, Coordinator--Elementary Mathematics Concepts with Calculators (EMC<sup>2</sup>), Lawrence Hall of Science, University of California, Berkeley, California
- Mr. Phil Mangold, Resource Teacher, Castro Valley Unified School District, Castro Valley, California
- Dr. Sally Mangold, San Francisco State University, San Francisco, California
- Mr. Rick Plescia, Sales Representative, Telesensory Systems, Inc., Palo Alto, California
- Mrs. Stephanie Richards, Mathematics Teacher, Indiana School for the Blind, Indianapolis
- Mr. Douglas Ritchie, Mechanical Engineer and Vice-President, Konigsberg Instruments, Pasadena, California
- Mrs. Margaret Ritchie, Vision Supervisor, Pasadena Unified School District, Pasadena, California
- Mr. Fred Sinclair, Consultant, Education of the Visually Handicapped, California State Department of Education, Sacramento, California
- Dr. Rose-Marie Swallow, California State University, Los Angeles, California
- Mrs. Sue Young, Mathematics Teacher, Tennessee School for the Blind, Nashville

Basic Approach to Beginning Language/Auditory and Oral Language Skills:  
Sing about Me (SAM)

Miss Ella Jenkins, Children's recordings artist, Chicago, Illinois

Martin-Allen Sound Productions, Louisville, Kentucky

Beginning Braille Reading Series

Mrs. Ruth Craig, Brigham Young University, Provo, Utah

Dr. Eric Hamp, University of Chicago, Chicago, Illinois

Dr. Philip H. Hatlen, San Francisco State University, San Francisco, California

Miss Freda Henderson, Retired Teacher at the Tennessee School for the Blind,  
Monkton, Maryland

Dr. Earl F. Rankin, University of Kentucky, Lexington, Kentucky

Dr. Evelyn Rex, Illinois State University, Normal, Illinois

Miss Marilyn Sorensen, Consultant, Vision and Physically Handicapped, Minnesota  
State Department of Education, St. Paul, Minnesota

Mrs. Bonnie Trowbridge, Teacher, Douglas School, Pekin, Illinois

Dr. Mila B. Truan, Tennessee School for the Blind and George Peabody College  
for Teachers, Nashville, Tennessee

Teacher Evaluators:

Miss Helen Berry, Primary Teacher, Missouri School for the Blind, St. Louis

Miss Paula Clemons, Readiness Teacher, Kentucky School for the Blind, Louisville

Mrs. Susan Fisher, Resource Teacher, Lakeview Junior High School, Downers Grove,  
Illinois

Miss Linda Havlik, Primary Special Teacher, Missouri School for the Blind,  
St. Louis

Miss Sharon Kitain, Primary Teacher, Missouri School for the Blind, St. Louis

Mrs. Debbie Mullarkey, Primary Teacher, Broadleigh School, Columbus, Ohio

Miss Joanne Racchini, Resource Teacher, Dearborn Heights School, Oak Lawn, Illinois

Mrs. Jodi Sticken, Itinerant Teacher, Rupley School, Elk Grove Village, Illinois

Miss Kathy Viskant, Resource Teacher, Butterfield School, Lombard, Illinois

Mrs. Mary Helen Welsh, Primary Teacher, Kentucky School for the Blind, Louisville

Miss Deanna Yeager, Primary Teacher, Kentucky School for the Blind, Louisville



Biological Models

Dr. Paul C. Beisenherz, University of New Orleans, New Orleans, Louisiana

Dr. Dean Brown, Colorado State University, Ft. Collins, Colorado

Dr. Ken Ricker, University of Georgia, Athens, Georgia

Dr. Ronald Simpson, North Carolina State University, Raleigh, North Carolina

Dr. Irwin Slesnick, West Washington University, Bellingham, Washington

Mrs. Dorothy Tombaugh, Biology Teacher, Lyndhurst, Ohio

Continental Relief Map Cassette Project

Mrs. Mary Nelle Council, Social Studies Teacher, Tennessee School for the Blind, Nashville

Criterion Referenced Tests/Beginning Braille Reading Series

Mrs. Eddy Jo Bradley, Directing Editor, Beginning Braille Reading Series, Chicago, Illinois

Miss Freda Henderson, Retired Teacher at the Tennessee School for the Blind, Monkton, Maryland

Mrs. Alice Queenon, Retired Teacher at the Missouri School for the Blind, St. Louis

Dr. Mila B. Truan, Tennessee School for the Blind and George Peabody College for Teachers, Nashville, Tennessee

Educational Games

Mrs. Donald E. Pohlmann, Hastings, Nebraska

Mr. Marvin Sanford, Teacher, Florida School for the Deaf and the Blind, St. Augustine

Materials for Fine Motor Skills Development

Miss Beth Langley, Specialist, Diagnostic Assessment Program, Child Study Center, George Peabody College for Teachers, Nashville, Tennessee

Mr. Philip Sandman, Displays/Designs Unlimited, Louisville, Kentucky

Miss Ann Sokolow, Industrial and Educational Materials Designer, San Francisco, California

Miss Pamela Wyatt, Teacher, Harris-Hillman Public School, Nashville, Tennessee

#### Materials for Prevocational Skills Development

Mr. Lee Hagmir, Prevocational Specialist, Northwest Regional Deaf-Blind Center, Seattle, Washington

Mr. Ted Lockett, Prevocational Specialist, Midwest Regional Deaf-Blind Center, Lansing, Michigan

Mr. Mike Minahan, Prevocational Specialist, New England Regional Deaf-Blind Center, Watertown, Massachusetts

Mr. Rodger Russell, Prevocational Specialist, Southwest Regional Deaf-Blind Center, Sacramento, California

Mrs. Ann Stoddard, Prevocational Specialist, Mountain Plains Regional Deaf-Blind Center, Denver, Colorado

Mr. Charles Zemalis, Supervisor of Deaf-Blind Prevocational Services, California School for the Blind, Berkeley

#### Mathematics

Mr. Joseph R. Caravella, Director of Professional Services, National Council of Teachers of Mathematics, Reston, Virginia

Dr. E. Glenadine Gibb, University of Texas, Austin, Texas

Dr. George Immerzeel, Price Laboratory School, University of Northern Iowa, Cedar Falls, Iowa

Dr. Evelyn M. Neufelt, San Jose State University, San Jose, California

Dr. Joseph N. Payne, University of Michigan, Ann Arbor, Michigan

Dr. Jack Price, Superintendent, Vista Unified School District, Vista, California

#### Metric Measurement

Dr. E. Glenadine Gibb, University of Texas, Austin, Texas

#### Teacher Evaluators:

Ms. Lisa Bingham, Itinerant Teacher, NEGA CESA, Winterville, Georgia

Ms. Angelyn Cavallero, Elementary Teacher, Tyler Elementary School, Washington, D. C.

Mr. Tom Coursey, Resource Teacher, Johnson Elementary School, Denver, Colorado

Mrs. Rebecca Crowell, Early Childhood Specialist, Tennessee School for the Blind, Nashville

Ms. Kathy Fitzsimmons, Resource Teacher, Ross School, San Diego, California

Mr. Anderson Frazier, Resource Teacher, NEGA CESA, Winterville, Georgia

Ms. Judy Levy, Elementary Teacher, Tyler Elementary School, Washington, D. C.

Mr. Hisashi Matsutani, Elementary Teacher, Frances Blend School, Los Angeles, California

Mrs. Rosemary S. Rotelli, Resource Teacher, Kennedy Elementary School, Medford, Massachusetts

Mr. Todd Sebright, Mathematics Teacher, Michigan School for the Blind, Lansing

Ms. Cindy Stahl, Resource Teacher, Johnson Elementary School, Denver, Colorado

Mrs. Sue Young, Mathematics Teacher, Tennessee School for the Blind, Nashville

#### Multihandicapped Needs Assessment Meeting

Mr. John Arinaccio, Teacher of Older Multihandicapped Students, Montana School for the Deaf and the Blind, Great Falls

Mrs. Brenda Armstrong, Teacher of Multihandicapped Students, Ohio State School for the Blind, Columbus

Mrs. Sue Birkenshaw, Teacher of Multihandicapped Students, Utah School for the Blind, Ogden

Mr. Robert Bush, Psychologist, Arkansas School for the Blind, Little Rock

Miss Marjorie Deiter, Prevocational Teacher of Multihandicapped Students, Michigan School for the Blind, Lansing

Mrs. Ann Galloway, California State University, Los Angeles, California

Miss Deborah Gourley, Michigan State University, East Lansing, Michigan

Miss Doris Maeser, Field Worker, New Jersey Commission for the Blind, Newark, New Jersey

Mrs. Maureen Saar, Teacher of Multihandicapped Students, St. Joseph's School for the Blind, Jersey City, New Jersey

Miss Connie Sheffer, Teacher/Parent Trainer, Infant Handicapped Intervention Program, Madison, Wisconsin



Mr. Chris Thompkins, Executive Director, Dallas Services for Visually Impaired Children, Dallas, Texas

Mr. Roger Wiley, Director of Residential Living, Oak Hill School, Hartford, Connecticut

Revision of the Utilization of Low Vision Kit

Mrs. Marianne May Apple, Editor, Low Vision Abstracts, Upper Montclair, New Jersey

Dr. Edward P. Berla', University of Louisville, Louisville, Kentucky

Mrs. Joyce Bromley, Materials Center for Visually Handicapped, Knoxville, Tennessee

Mrs. Pat Carpenter, Educational Consultant, Visually Impaired Program, DeKalb County School System, Scottdale, Georgia

Mrs. Ruth Holmes, Educator and Consultant, Illinois School for the Visually Handicapped, Jacksonville

Mrs. Wilma H. Hull, Boston College, Chestnut Hill, Massachusetts

Dr. Randy Jose, Center for the Blind, Philadelphia, Pennsylvania

Dr. Rosemary O'Brien, Supervisor Vision Services, Montgomery County Public Schools, Bethesda, Maryland

Dr. Douglas K. Ozias, Deputy Director, Governor's Coordinating Office for the Visually Handicapped, Austin, Texas

Dr. Earl F. Rankin, University of Kentucky, Lexington, Kentucky

Dr. Rona Willen Shaw, Institute of Child Study, Kean College of New Jersey, Union, New Jersey

Mrs. Rose Skolnick, Head, Vision Stimulation Program, Overbrook School for the Blind, Philadelphia, Pennsylvania

Miss Mildred Smith, Teacher, Texas School for the Blind, Austin

Dr. Dean W. Tuttle, University of Northern Colorado, Greeley, Colorado

Sensory Stimulation Kit

Mr. Jim Fuller, Product Safety Engineer, U.S. Testing Co., Hoboken, New Jersey

Dr. Susan Kershman, University of Kentucky, Lexington, Kentucky

Mrs. Sali LeVan, Upsal Day School for the Blind, Philadelphia, Pennsylvania

Mr. Frank Pepe, Toy Safety Engineer, U.S. Testing Co., Hoboken, New Jersey

Spatial Concepts Studies

Dr. Edward P. Berla', University of Louisville, Louisville, Kentucky

Tactile Display Kit

Mrs. Betty Epstein, President, National Braille Association, Miami, Florida

Mrs. Florie Feder, Colorado IMC for Visually Handicapped, Denver, Colorado

Mrs. Helen Grapka, Teacher, New York State School for the Blind, Batavia

Ms. Lucia Menges, Social Science Consortium (Materials Adaptation for Visually Impaired Students in the Social Studies Project), Boulder, Colorado

Mrs. Mary Shipley, Florida Instructional Materials for the Visually Handicapped, Tampa, Florida

Two- and Three-Dimensional Relationships in Mathematics

Teacher Evaluators:

Mr. John Fant, Mathematics Teacher, Laurel Ridge School, Decatur, Georgia

Mrs. Dixie Howser, Mathematics Teacher, Kentucky School for the Blind, Louisville

Mrs. Stephanie Richards, Mathematics Teacher, Indiana School for the Blind, Indianapolis

Publications during FY 1978

- Barraga, N. C., Collins, M., & Hollis, J. Efficiency in visual functioning: A literature analysis. Journal of Visual Impairment & Blindness, 1977, 71, 387-391.
- Berla', E. P., & Butterfield, L. H., Jr. Tactual distinctive features analysis: Training blind students in shape recognition and in locating shapes on a map. Journal of Special Education, 1977, 11, 335-346.
- Franks, F. L. The tactile modality in adapting and developing science materials for handicapped students. In H. Hoffman (Ed.), A Working Conference on Science Education for Handicapped Students: Proceedings. National Science Teachers Association, 1978.
- Franks, F. L. Use of the APH Student Speech Plus calculator by young blind students: A preliminary needs meeting report. Louisville, Ky.: American Printing House for the Blind, 1978.
- Franks, F. L., & Murr, M. J. Biological models for blind students. Journal of Vision Impairment & Blindness, 1978, 72, 121-124.
- Special Office for the Visually Impaired: Final technical report (OE Contract No. 300-75-0046). Louisville, Ky.: American Printing House for the Blind, 1977.











# American Printing House for the Blind

Incorporated

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## DEPARTMENT OF EDUCATIONAL RESEARCH

~~Professor~~ ~~Secretary~~ ~~REPORT ON RESEARCH AND DEVELOPMENT ACTIVITIES~~  
~~1979~~

FISCAL 1979

Included in this report are brief descriptions of projects underway during FY 1979 and planned for FY 1980, in the Department of Educational Research at the American Printing House for the Blind (APH). They include research and development activities in the areas of early childhood, multi-handicapped, low vision, reading, mathematics, science, social science, tactile graphics, educational measures, educational games, and a special lamp project. Additionally, two studies are planned which will provide a data base for legally blind students related to degree of vision/mode of reading and academic achievement. Included also is a description of the Department's involvement with the largest single project ever undertaken by APH; namely, the preparation of a recorded edition of The World Book Encyclopedia.

Funding for these projects has come from a number of sources in addition to APH's direct appropriation from the federal government for research and development. Such additional funding is essential if APH is to maintain a program of research and development as extensive as the one described in this report. Several of the projects described were or are funded through separate grants from the Bureau of Education for the Handicapped (BEH). These are: Development of a Beginning Braille Reading Series, Revision of the Utilization of Low Vision Kit, and Recorded References for the Visually Impaired and Other Handicapped. The braille and low vision projects were funded under BEH's Handicapped Research and Demonstration Program and the recorded references (encyclopedia) project under BEH's Handicapped Media Services and Captioned Films Program. A project to be initiated during FY 1980, Audio-Tutorial Reference Materials in Biology (Cell Division), will be funded through a grant awarded by the National Science Foundation. All other projects described in this report were funded by APH through the federal appropriation.

During the year the Department's staff needs were met and two research interns served in a joint intern program with the Deaf-Blind Department of

the Kentucky School for the Blind. As always, Printing House staff and a wide array of professionals worked closely with the research staff. Additionally, research staff formed close ties with Displays Unlimited, a Louisville firm that has served as the model maker for many of the materials development projects. Input from the skilled staff of this firm has greatly enhanced this phase of the work.

In toto, FY 1979 was a productive year. The success of APH's research program reflects the full cooperation afforded it by agencies and individuals working in the field and by the wholehearted cooperation and support of APH's leadership and staff.

### Progress in Specific Research Activities

The organization of this report indicates for each project the work completed during FY 1979 and the work planned for FY 1980. In instances where a project was completed during FY 1979, no additional work is indicated; in other instances, new projects will be undertaken during FY 1980. For each project, research staff who have worked or will work on it are identified. The nature of all projects is determined by the needs of the field. Once a new material has been developed, evaluated, and found satisfactory, it is recommended for production approval. Upon being approved, it enters APH's production pipeline.

### Early Childhood and Multihandicapped

#### Needs Identification: Early Childhood Materials

Work completed during FY 1979. A needs assessment meeting to determine materials development priorities for infant and preschool visually impaired children was conducted in April 1979. The target population was the blind child without severe additional handicaps. Approximately 30 professionals across the United States actively working with infant and preschool visually impaired children served as consultants for the needs assessment. Participants were divided into groups and asked to identify and prioritize curriculum areas in which materials were needed. Subsequently, they wrote specifications for a variety of materials to teach skills within each prioritized curriculum area.

After dividing into three groups to discuss priority areas, each group reported briefly on its discussion. Several of the suggested "need areas"--manipulative, sensory, and low vision stimulation material--have already been addressed by APH. There was a consensus among groups that materials are especially needed in two areas. There were: materials for children in cribs, and materials to encourage visually impaired children to reach out, creep towards an object, bring hands together at midline, and achieve object permanence--all critical developmental steps. Other areas of need were mentioned, and specific materials received discussion. Participants

reported that body awareness, self-occupation, and materials to promote socialization skills were needed. A parent manual containing ideas for home-made materials and home activities for blind infants and preschoolers was given high priority. Development of a prebraille kit and materials to overcome tactual defensiveness were also deemed important. Sheri Bortner and Suzette Frere conducted the needs assessment.

### Sensory Stimulation Kit

Work completed during FY 1979. The Sensory Stimulation Kit was approved for production, pending needed revisions, evaluation of all items utilizing federal safety standards, and resolution of some packaging questions, in October 1977. All kit items were tested by U.S. Testing Company, Inc. in Hoboken, New Jersey, for product safety. The items were tested for conformance to the requirements of Title 16, Chapter 11, Federal Hazardous Substances Act Regulations, "Test Methods for Simulating Use and Abuse of Toys, Games and Other Articles Intended for Use by Children." Two modifications were made as a result of the tests performed.

Due to production staff changes, a complete reorientation to the materials was given to the new production personnel. Ongoing consultation was provided to production staff. A report was written concerning modifications necessary to bring the sample production run kits back to initial specifications. Several meetings were held to determine how to implement these necessary modifications. Contacts were made to secure correct suppliers of materials needed in order to assure they would meet specifications. A wealth of correspondence concerning the sensory materials was answered.

The first generation of Sensory Stimulation Kits was released in May 1979. Upon receipt of a Kit, the teacher may borrow a videotape from APH which illustrates the sensory materials being used with two multihandicapped, visually impaired students. Sheri Bortner directed this project.

### Flashlight and Penlight with Color Caps

Work completed during FY 1979. The flashlight with color discs and penlight with color caps were developed as part of the Sensory Stimulation Kit. Because these items are useful with students functioning at various developmental levels, additional software was also designed to accommodate various developmental/response levels.

The flashlight has five translucent color discs (white, yellow, blue, red, green). The penlight has five translucent color caps with rubber fittings (white, yellow, blue, red, green) and four transparent color caps (yellow, red, blue, green). A set of 5 X 8 inch (13 X 20 cm) cards, outlining a wide range of suggestions for using the flashlight and penlight, accompany the items. These activity cards state behavioral objectives as well as cautions regarding proper use of the penlight and flashlight. The cards are organized into four graduated levels of responsiveness: tolerance,



identification, exploration/selection, and discrimination. The cards suggest 75 activities for children functioning from birth through the primary elementary grades (1-3). Sheri Bortner was assisted by Suzette Frere in this project.

#### Materials for Fine Motor Skills Development: Manipulative Trays and Activity Center

Work completed during FY 1979. Two sets of materials, the Activity Modules and the Manipulative Trays, were developed in FY 1978, under the Materials for Motor Skill Development project. The APH Activity Center is composed of eight fine motor activity units which combine to make four modular components. A component of two activity units measuring 5 X 10 inches (13 X 25 cm) can be presented, or the total of eight units, measuring 20 X 40 inches (51 X 102 cm). Trays are provided which allow for combining the activity units in sets of two. Activity units are: push in/pull out box (interchangeable), squeaker box (interchangeable), paper roll for turning, ribbed writing surface, three-tiered spinner, tactile box with door (interchangeable), tambourine with turn knob, and cage with bells.

The Manipulative Trays consist of five stackable units, each presenting materials for the development of fine motor skills. The five items presented are: spinners--presenting varying degrees of difficulty in turning, also brightly colored and patterned; cogs--bright colored plastic "wheel" cogs that turn via a knob; track--allows knob to move in circular, horizontal, and vertical positions; chimes--colorful wheels mounted to produce a "chime" sound when rotated; three different sounds can be produced; spings--brightly colored wooden balls secured to a wooden dome by springs. Each unit is contained within a wooden tray, designed for vertical stacking. The units measure approximately 10 X 12 inches (25 X 20 cm) each.

Both sets of materials were approved for production in November 1978. All modifications have been completed, and specimen models have been prepared for the Production Department of APH. Accompanying software has been revised and a first draft submitted to an editor. The services of a commercial artist were secured to do drawings for the activity cards. In preparing the Manipulative Trays and Activity Modules for presentation to production, detailed draftsman's drawings have been made for each item and its component parts. To further assist production staff, approval to supply needed parts has been received from three commercial toy companies. An outline summarizing the development of the motor materials has been written in preparation of a more detailed report.

Each item has been submitted to U.S. Testing Company, Inc. in Hoboken, New Jersey, for product safety. The items were tested for conformance to the requirements of Title 16, Chapter 11, Federal Hazardous Substances Act Regulations, "Test Methods for Simulating Use and Abuse of Toys, Games and Other Articles Intended for Use by Children." The most stringent criteria were selected, those applying to 0-18 month old infants. In addition, project staff consulted with Edesel Movie, Kentucky/U.S. Consumer Safety Representative, concerning product safety assistance during the development phases. Suzette Frere assisted Sheri Bortner on these two projects.

Work planned for FY 1980. Project personnel will continue to work cooperatively as a liaison between research/development and the manufacturing division. Assistance will be available as needed. A final project report will be written, tracing the development of the materials from needs assessment to product completion/availability.

### Auditory Nerf Ball

Work completed during FY 1979. A survey was made of commercially available nerf balls with beepers. Fifteen auditory nerf balls were purchased from Blind Sports, Inc. The balls were field tested by teachers of infant, preschool, and multihandicapped blind students as well as a recreation therapist, an orientation and mobility specialist, and several physical education teachers. The balls were used over a 3-4 month period in residential, private agency, and public school programs. Written evaluations, completed by the field testers, elicited a variety of information. This included the functional level of the students, the developmental ranges for which the ball is best suited, activities in which the ball was used, relative interest to other classroom materials, the manipulability of the ball, activation/control of the beeper device, the clarity and amplification of the auditory component, the visual interest afforded by the ball decoration, the potential usefulness of the ball, availability of similar materials, durability, and safety of the auditory nerf ball.

The ball received high ratings, except in an area of crucial importance--durability. The beeper mechanism frequently stuck or did not work at all, and the batteries are difficult to replace. A more dependable, encased beeper replacement continued to be a problem. The project will be terminated unless a ball of suitable durability can be located. The project staff included Carson Nolan, Sheri Bortner, and Suzette Frere.

### Prevocational Materials Development

Work completed during FY 1979. The development of prevocational materials for higher functioning multihandicapped, visually impaired students was deemed first priority in a needs assessment conducted by APH in April 1978. A committee meeting of seven regional deaf-blind center prevocational consultants was held in Los Angeles in May 1978, in conjunction with a national deaf-blind exchange session. The purpose of the meeting was to determine specific materials needed to accomplish skills deemed necessary for a prevocational multihandicapped, visually impaired student.

A literature review was conducted in the area of prevocational skills for the multihandicapped, visually impaired student and the severely handicapped individual. Curriculum and program models were collected and reviewed for applicable materials. Regional Deaf-Blind Center prevocational specialists assisted in this task. Seven prototype prevocational materials were developed

for formative evaluation. The materials were: Folding jig--to assist the student in folding letters to fit into envelopes. The paper is inserted and metal flaps on hinges fold over to crease the letter into three parts. Container lids/tops--two sets of container/jars were mounted onto a board. One set requires the student to screw the lids onto the jar; the other set requires a push down/pull off motion. Jars/containers were graduated from a 1/2 turn to several turns; Tray--for assembling, sorting, and matching tasks; removable dividers inside the tray allow for various sized vertical and horizontal compartments. Assembly materials--100 pens will be provided for practice in a simple assembly task. Tool kit--a set of beginning tools. Supplemental materials--an annotated bibliography.

A formative evaluation was conducted. Both student data and teacher evaluation data were collected. Revisions were made to each prototype material, based on the testing results. Also, two new items were added--a five bin interchangeable assembly/sorting box and a set of square screw on/off containers. Revised and new materials were generated in quantity for field testing at 10 sites. Multihandicapped, visually impaired students who have acquired basic language, motor, and self-help skills, were involved in testing the prevocational materials. Field testing sites included schools for the blind, public schools, private agencies, and institutional programs. Ten sites participated in the field testing, involving over 100 multihandicapped, visually impaired students.

Student data and teacher evaluation data were collected. Teachers using the materials completed evaluation forms that were used to document the effectiveness and quality of the prevocational materials. Data collected included information on the manipulability of the prevocational materials, durability, safety, interest level of the students relative to similar materials, effectiveness in teaching identified skills, and the value and extent of accompanying written materials. Both the tangible apparatus and the accompanying written materials were critiqued by the field test teachers. APH staff introduced the materials to the teachers and explained testing procedures and evaluation. Project personnel worked with program staff in collecting the student data. Prevocational project committee members also worked with APH personnel in collecting student data. Based on their first hand experience, they provided an additional critique of the materials. Revisions were made, based on the compilation of the field testing data. Suzette Frere and Bill Duckworth assisted Sheri Bortner on this project.

Work planned for FY 1980. Based on the field evaluation data, final revisions will be made on two more sets of prototypic materials. Along with the set already revised, this will provide a set for APH research, one for APH production, and one for use with U.S. Testing Company, Inc. Simultaneously, a final expert review will be conducted by an authority in prevocational skills development, not previously involved with the project. Product safety and durability tests will be conducted on each prevocational material before entering the APH production pipeline. Each item will be tested for conformance to the requirements of Title 16, Chapter II, Federal Hazardous Substances Act Regulations, "Test Methods for Simulating Use and Abuse of Toys, Games and Other Articles Intended for Use by Children." If necessary, revisions will be made to the materials, based on the U.S. Testing Company's safety report.



The software will be reviewed by an editor. A detailed report on the development of the prevocational materials will be constructed. The following prevocational materials will be submitted to the APH manufacturing division:

1. Paper folding jig
2. Round bottle (screw on/off top) jig
3. Square bottle (screw on/off top) jig
4. Nut/bolt/washer board
5. Nut/bolt/practice boards (three size variations)
6. Beginning assembly and sorting tray (5 interchangeable bins)
7. Advanced assembly and sorting tray (interchangeable horizontal and vertical dividers)
8. Software

### Low Vision

#### Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students (0-36 months)

Work completed during FY 1979. Literature and curriculum reviews were undertaken in the area of vision stimulation for developmentally young students. An extensive review of the development of vision in normal children was conducted (target: birth to 36 months). Work proceeded on incorporating a materials section into the various visual developmental levels. A project staff member visited five programs to observe vision stimulation programs with multihandicapped, visually impaired and preschool students. Also, staff met with Upsal Day School's low vision for multiply handicapped, visually impaired grant personnel and George Peabody College for Teacher's multiply handicapped, visually impaired vision stimulation grant personnel to review their efforts in this area. Questionnaires (50) were developed and sent to program supervisors and teachers to determine materials currently used and those needed to provide low vision stimulation. Staff in-service in low vision was initiated on a weekly basis. An extensive review of commercial materials, useful in promoting the development of residual vision, was conducted. A committee of professionals with expertise and experience in low vision training for the low functioning child was organized to assist project personnel. The group met in February 1979 and evaluated commercial materials, suggested prototypes for APH to develop, and discussed software to accompany the kit of materials.

The project was divided into three components for the formative evaluation: commercial items with high visual interest; APH adapted commercial materials; and fluorescent materials for use in a black light environment. Subjects utilized in the formative testing were multihandicapped, visually impaired with an overall functional level of birth to 36 months. Students were distributed among residential schools for the blind, private agencies, and public school programs. Sites were selected with competent teachers motivated to provide their students with vision stimulation experiences. Two components for formative evaluation were completed within FY 1979: the commercial items with high visual interest and the fluorescent items for use in a black light environment. The materials were used by teachers of infant, preschool, and multihandicapped, visually impaired students functioning birth to 36 months.

Several committee members have been involved in reviewing and critiquing the activities and related materials to be included in the kit. Extensive teacher evaluations were used in the formative testing to gain evaluative information for revisions. Information was elicited concerning the developmental level for which the materials are most appropriate; vision stimulation materials currently used; the relative interest level of the materials for the students; ratings for each material; improvements to be incorporated into the revision of the materials; suggestions for additional items and related written material; durability, construction, and safety of the materials; and so on.

A comprehensive chart of visual development from birth through 36 months has been developed. References are cited for each developmental task. A second column, listing educational materials useful in developing specific visual functioning tasks is included. Two expert reviews have been conducted on the visual development sequence and educational materials chart. Sheri Bortner was assisted by Amie Dennison and Suzette Frere on this project.

Work planned for FY 1980. Formative evaluation of the black/light materials will be initiated at three program sites. Formative evaluation will also be conducted at three program sites on APH adapted or developed materials. Based on the formative evaluation data, revisions will be made. The software will also undergo revision, based on expert review. Field testing will be conducted utilizing 8-10 program sites with geographic and program type/model distribution. Revisions will be made to the materials and software, based on the field evaluation data. The Low Vision Stimulation and Training Materials are scheduled for production approval at the 1980 annual meeting.

#### Light Box and Accompanying Materials for Developmentally Young Students (0-48 months)

Work planned for FY 1980. The need for a light box and accompanying materials was first expressed by members of the Vision Stimulation and Training Materials committee in February 1979. Committee members felt that an improved light box should be developed by APH. Such a light box should include a rheostat to control lighting levels, a light source which would not overheat, a means of adjusting the box so it could be tilted, and a convenient means of transporting the box and accompanying materials. Committee members also suggested a variety of materials to accompany such a light box. Written materials included with the hardware should provide guidelines for use of the light box and should indicate a general sequence in which light box activities might be presented.

Because of the expense and bulk these materials would add to the set of Vision Stimulation and Training Materials being developed, it was decided to develop the light box and its accompanying materials as a separate unit. Suzette Frere will be responsible for this project.

## Revision of the Utilization of Low Vision Kit

There are four parts to this set of materials, which is now being called "Program to Develop Efficiency in Visual Functioning." They are: (a) Program Guide, (b) Diagnostic Assessment Procedure, (c) Design for Instruction, and (d) Supplemental Source Book. The basic rationale for the program is that learning through an impaired visual system occurs slowly, but follows the same sequential pattern as visual development in a normal system.

Work completed during FY 1979. During the fall of 1978 studies were conducted to identify procedural difficulties with administration of the Diagnostic Assessment Procedure and to determine the instrument's reliability. For the former, sets of the assessment materials were sent to five of the project's consultants for use. These persons, all familiar with assessment of low vision, critiqued the instrument for ease of use. This critique indicated no changes were needed for the items and only a few minor ones for the manual. Twelve teachers, 2 from residential schools and 10 from public schools, participated in the reliability study. These teachers were trained in administration of the instrument. Data resulting from this study were computed on an  $N$  of 112. Reliability estimates were based upon internal consistency coefficients (Kuder-Richardson 20) and correlations between pre and post assessments. The KR 20 correlation was  $r = .94$  and the test-retest correlation was  $r = .96$ . These statistics demonstrate the Diagnostic Assessment Procedure to be an extremely reliable instrument. Other highlights of the analyses were that there were no bad items (negatively discriminating) and that empirical evidence was found to support the basic rationale for the program. Consequently, no revisions were indicated for the Diagnostic Assessment Procedure.

The initial draft of the Supplemental Source Book was reviewed by project staff and by six of the project's consultants during the fall of 1978. Subsequently, project staff agreed on needed revisions and work on these was undertaken.

Additionally, the Program Guide and the Design for Instruction were revised as indicated in an earlier review by project consultants. These modified materials were then subjected to further review by project staff and four consultants, three of whom were not familiar with the materials. Subsequently, these parts of the program were again modified.

This project is funded by BEH.

Project staff included Natalie Barraga and her staff at the University of Texas (Austin), and June Morris, Amie Dennison, Deborah Willis, Ed Berla', Mary Ann Kapp, and Carla McMillin of APH's staff. Carol Rogers, a commercial artist in Austin, prepared the graphics that accompany the program. Earl Rankin, of the University of Kentucky, played a major role in evaluation of the Diagnostic Assessment Procedure.

Work planned for FY 1980. The materials list, which is a listing of commercial items that can be used in training visual functioning for greater



usefulness, will be updated early in this year so that this information, which is included in the Supplemental Source Book, will be current when the Program materials go out for full field review. Sets of the Program materials will be accumulated and placed in the field with 12 teachers of visually handicapped students. These teachers will use the materials for an 8-week period during which time they will both critique the materials and evaluate use of them. As the program is designed to be self-instructional, the teachers who are evaluating it have had no training in use of the Program materials. After the field evaluation data are compiled, the program will be modified as needed.

## Reading

### Beginning Braille Reading Series

This project, the Development of a Beginning Braille Reading Series, was initiated in September 1975 and was supported by a grant from BEH. The major objective of the project was to develop a set of braille reading materials designed to overcome, or minimize, many of the problems encountered by children who must learn to read using the braille code. The entire set of materials consists of a readiness level reader, three preprimers, one primer, and book 1, book 2, and book 3. Each of these readers is accompanied by a teachers' guide and a set of consumable worksheets, with the exception of the readiness level reader which is a consumable text and has no worksheets.

The 1st year of the project (FY 1976) was spent in conducting a thorough review of research in the areas of braille reading, tactual perception, concept development in blind children, and general reading; and in the development of a detailed set of specifications for writing the series, based on the review. These specifications were then given to a directing editor who had extensive experience in writing children's reading materials and who has been responsible for the actual writing of the braille reading materials.

During the 2nd year of the project (FY 1977), the writing of the readiness reader, the three preprimers, the primer, and their accompanying materials was completed. During the 3rd year (FY 1978), book 1, book 2, and book 3 and their accompanying materials were written.

The evaluation phase of the project began in the 2nd year and has been ongoing. This phase consists of placing each level of the series in the field with a group of students who have progressed through the series. As the materials are used in this way, teachers evaluate them by collecting data on the children and by completing evaluation forms as each level is completed. Simultaneously, the teachers critique the materials as they use them.

Throughout the project, APH staff has been assisted by a consulting committee of experts in braille reading and general reading who have reviewed all materials as they were developed and made recommendations for

revisions. These recommendations are used in conjunction with the evaluation data and teacher critiques to make final revisions.

Work completed during FY 1979. During the year, the readiness and pre-primer levels were completed by all students in the field evaluation who had not previously completed them and final revisions were made. Procedures were initiated for these levels in preparation for final production. BEH funding terminated during the year.

Hilda Caton and Eleanor Pester have been responsible for this project. They were assisted by Carla McMillin. Eddy Jo Bradley has served as directing editor. Nancy Pitt, an APH stenographer operator, has worked with project staff in preparing the special braille plates required.

Work planned for FY 1980. Plans have been made for continuation of the field evaluations and revisions of the primer, book 1, book 2, and book 3 materials. It is anticipated that completion of these activities will take approximately 3 years more. The actual production of the materials is scheduled so that the beginning levels--readiness, preprimer, and primer--will be available for use during the school year starting September 1980. The remaining levels will be produced in subsequent years as the field evaluation and revisions are completed. Production will be scheduled so that each level of the series will be available as needed.

#### Criterion Referenced Tests for Beginning Braille Reading Series

During FY 1977 a project was initiated to develop a set of criterion referenced tests to accompany the Beginning Braille Reading Series. A set of tests was needed for this program because the unique presentation of braille in this reading series made the use of standardized tests inappropriate until the series is completed. The basic objective of this project is to develop six tests to accompany each of the six levels of the program; namely: readiness, preprimer, primer, book 1, book 2, and book 3.

The test for each level is developed as the readers are written. Item trials are conducted as students in the field evaluation complete each level. Final editions of the tests will be produced and distributed with each level of the reading series.

Dr. Earl Rankin, of the University of Kentucky, has been responsible for designing the tests at each level. APH project personnel have been responsible for writing the items and administering the tests. This project was directed by Hilda Caton and Eleanor Pester. Mercia Segovia has assisted with it.

Work completed during FY 1979. As students in the field evaluation completed a level of this program, they were tested with the experimental edition of the appropriate test for the level. During this year, individual students completed the preprimer, primer, and book 1 levels and were tested. The readiness and preprimer levels were completed by the last of the students using them during the year, thus final editions of these tests could be developed.

Work planned for FY 1980. Students will continue to be given the appropriate level of the criterion referenced tests as they progress through the reading program. It is anticipated that all students will have completed the primer and book 1 levels by the end of this year. Thus, these tests can be finalized.

## Mathematics

### Needs Identification: Mathematics

Work completed during FY 1979. A needs meeting in mathematics, was held in Louisville in July 1979. Ten expert teachers of visually handicapped students from day and residential schools reviewed basic mathematics concepts/operations as assessed by six national math content experts. Working within the framework of these content priorities, teachers of the visually handicapped specified instructional materials needs. The highest priority established was for the development of entry level, primary grade math materials which are designed to introduce/illustrate/teach concretely basic math operations and concepts to blind students. Early math texts are too visual and cannot be transcribed into braille with meaningful tactile representations. Consensus was unanimous for these materials.

Additional high priority materials included: a teacher's guide to instruct students in a systematic approach to examining graphs and charts, investigation and evaluation of commercially available materials by APH to determine those which can be used or adapted by visually handicapped students, more two- and three-dimensional geometry materials, a tactually legible meter stick for blind students, metric area measurement materials, adaptation into braille of the KeyMath Diagnostic Arithmetic Test (American Guidance Service), item analysis of the Stanford Achievement Test's math tests, more calculator materials--and for younger students, development of a geometric resource book of plane figures, improvement of the quality of shading and graphics in all areas of braille reproduction of algebraic and geometric illustrations, need for a math educator to proof all plates prior to printing in math subject matter, and simplification of the Nemeth Code for basic school texts.

The meeting was conducted by Frank Franks.

### Metric Measurement Materials and Aids

Work completed during FY 1979. The metric measurement readiness program was designed to introduce basic measurement operations in linear measurement, volume/capacity, and mass/weight. The scope of the program includes the development of instructional materials that (a) provide prenumber measurement activities, (b) utilize basic number concepts taught by the teacher, and (c) combine the two to introduce number measurement. The activities emphasize prenumber measurement experiences with concrete materials which provide background for the higher degree of abstraction required for measurement using numbers. Process related activities in classifying, comparing, ordering, and measuring are integral components of the instructional program.



Volume/Capacity. Eleven sets of volume/capacity materials were sent to participating teachers in eight public school and three residential school classes (K-6) across the country. Field reports indicated that students proceeded more rapidly through the lessons than they did through the linear measurement section. Improved packaging of the volume/capacity materials drew enthusiastic responses from teachers. The readiness materials are packaged by lesson. The more sophisticated standard unit aids, which can be used with advanced measurement activities in textbooks, are packaged together in one container.

Mass/Weight. A wide variety of mass/weight aids was assembled and used in presenting numerous concept-related activities to blind students. As appropriate activities and aids were identified, they were categorized using the measurement program format. Development activities climaxed in December with a writing conference in which this information was utilized in preparing a draft of the mass/weight section for field evaluation.

In January, the project director used selected activities from the instructional program with a class of third grade students and with representative students from grades four, five, and six. The program received further editing, copies were made, and the aids and materials were packaged and distributed to 11 participating teachers for field evaluation. Again, response was enthusiastic. Although direct carry-over did not appear from linear to volume to weight measurements, student performance improved from one set of materials to the next.

This project was directed by Frank Franks, assisted by Bob Glass and Deborah Willis. The APH project staff was assisted in development of the program by LaRhea Sanford, Tuck Tinsley III, and Sandra Albrecht of the Florida School for the Deaf and the Blind.

Work planned for FY 1980. Early this year the materials will be modified as indicated in their field evaluation in preparation for production.

## Two- and Three-Dimensional Relationships

Work completed during FY 1979. Two aids with manuals have been developed for use in introducing/illustrating/demonstrating a broad range of spatial concepts to blind students (grades K-12) utilizing a hands-on approach. Students can progress from two-dimensional relationships to three-dimensional ones using the materials. The two-dimensional aid consists of a square board with regularly spaced holes (five units in each direction from the origin) connected by grooves. The student can move forward, backward, left, or right on it by counting spaces and moving pegs from hole to hole to perform a number of spatial activities.

The three-dimensional board, with the same dimensions as the two-dimensional board (plane), is mounted five units above a base. The three-dimensional board extends five units horizontally and provides point markers for

locating points from one to five units vertically. Horizontal positive and negative points in space are marked by pegs in the appropriate unit hole from the origin. Points in the vertical dimension are indicated in the appropriate units by point markers which are from one to five units in length. Positive points in space are indicated above the board and negative units are indicated below the board.

Six sets of mathematics aids (Two- and Three-Dimensional boards) were completed and two manuals (Two Dimensional Relationships, Three-Dimensional Relationships) were drafted and prepared for evaluation. Six mathematics teachers who had blind students in their classes in four day school and two residential school classes critiqued the materials. The two manuals were reviewed for context by a mathematics educator of national prominence.

The field evaluation indicated that blind students performed the two-dimensional activities with ease and pleasure. The sequential presentation of activities--when used with the accompanying aid--appeared to motivate students, capture their interest, and promote their success in performing the activities. Content review of the two manuals was received and used in final editing of the manuals. The program and materials for Two- and Three-Dimensional Relationships is now ready to be submitted for production approval.

Frank Franks was director of this project with assistance from Tuck Tinsley, Florida School for the Deaf and the Blind; Tony Evancic, Philadelphia Public Schools. Bob Glass was the APH research assistant on the project.

### Introductory Mathematics Project

Work planned for FY 1980. Much information in elementary and junior high mathematics texts is presented or introduced pictorially/schematically and is of questionable value to the blind and partially seeing student. Pictorial illustrations which have facilitated the introduction of multitudes of concept-related activities in mathematics for young sighted students have had an inverse effect on instruction for young blind students. The three-dimensional representations portrayed pictorially in primary mathematics texts do not lend themselves to two-dimensional representation nor to meaningful transcription into braille. No parallel body of conceptual information in mathematics for the young blind student exists. This entry-level content is critical since it underlies the performance, mastery, and comprehension of basic mathematics operations. Consequently, there is a great need to develop tactile aids and/or alternative procedures for establishing a content base as early as possible for these students if they are to approach performance at grade level in mathematics.

In an effort to counter the negative effect cited, APH will examine early mathematics curricula with focus on prekindergarten and kindergarten levels (a) to identify basic mathematic operations, (b) to examine potential

suitable concrete materials and manipulatives, and (c) to specify techniques and activities which can be used to introduce/teach entry level operations using the concrete materials identified. The results of the study will be used to determine and to set specifications for developing instructional materials, including accompanying tactile aids, for teaching basic mathematics operations to young blind students.

Frank Franks will be the project director. He will be assisted by Bob Glass and Mercia Segovia. Additionally, Sandra Albrecht, of the Florida School for the Deaf and the Blind will participate in the development of these materials.

#### Needs Identification: APH Student Speech Plus Calculator--A Market Study

Work conducted during FY 1979. The APH Student Speech Plus Calculator, a special version of the Speech Plus<sup>TM</sup> calculator developed by Telesensory Systems, Inc., became available from APH during the fall of 1977. In order to follow-up on its use, a list of ship-to addresses of those individuals and institutions having ordered one or more between July 1, 1977, and September 30, 1978, was compiled. A questionnaire was designed regarding: (a) needed design modifications or extensions that would make the calculator more suitable for educational purposes, (b) innovative uses, and (c) needs for additional training materials, and sent to purchasers.

Twenty-five percent of the questionnaires sent out were returned. They came from 43 states in the U.S. and 1 province in Canada. The responses were compiled and, in general, indicated teachers were extremely pleased with the calculator. The consensus on training material needs was that the manual accompanying the calculator, the intermediate level self-instructional book entitled Computation and Problem Solving for Young Adults, available from APH, and the two volumes of practice materials under development for use at the elementary level will provide a thorough program that will meet the needs of most students. This study was conducted by Deborah Willis.

#### APH Student Speech Plus Calculator Materials

Work completed during FY 1979. In November 1977, 14 participants representing general and special education, teacher education, industry, the California Clearinghouse Depository for Handicapped Students, and APH met in San Francisco to explore types of materials needed by blind students for understanding calculator applications. Immediate needs for materials recommended by participants included a minimum of three sets of materials:

1. Materials to introduce the APH calculator to primary-elementary grade visually handicapped students
2. Workbook practice materials which focus on computation for elementary grade students.
3. More advanced materials which emphasize problem solving for upper elementary junior high and secondary students



The immediate need (as expressed in recommendations 2 and 3 from the needs meeting) was for practice materials which focus on computation for elementary grade students and materials which focus on computation for elementary grade students and materials which emphasize problem solving for older students. To meet this need, two volumes of practice materials were developed. The first volume emphasizes fundamental operations in computation. The second volume focuses on problem solving activities.

Skeleton lessons from the Volume 1 (Computation) Manual were sent to teachers who used the lessons with students and suggested simple "word" problems to facilitate transition into the Volume 2 (Problem Solving) Manual. This information was incorporated into the first complete draft of Volume 1.

The draft of Volume 1 was sent for field critique and evaluation for appropriateness for use by mainstreamed blind students. Skeleton lessons from the Volume 2 (Problem Solving) Manual also were sent to participating teachers for evaluation. Meetings of the project director and authors were held to complete the development of the two volumes.

Tony Evancic, Tuck Tinsley, and Bob Glass are co-authors of the manuals. Frank Franks was project director.

## Science

### Needs Identification: Science

Work completed during FY 1979. A national meeting in science needs of blind students was held March 23-25, 1979, in conjunction with the National Science Teachers Association convention as one step in attempting to identify critical needs of visually handicapped students enrolled in science classes. Participants included science teachers of blind and visually handicapped students in residential and day school classes. Six nationally prominent science experts and textbook authors had performed a "science content assessment" previously which provided a content base for setting priorities.

Nine science teachers of visually handicapped students were identified and invited to participate in the needs meeting. Intensive efforts to locate science teachers in public school programs with braille students mainstreamed in their classes resulted in identification of four such teachers. One graduate student from Georgia Tech who used braille, and who had chemistry and physics prior to college entrance, also participated.

Highest priority recommendations from the group include:

1. A need for better instrumentation and greater accuracy in existing aids (e.g., platform balance) to improve specific measurement for blind students

2. A need for audio-tutorial and hands-on programs for science students at all grade levels
3. A need for a series of kits relating to electricity and electronics which could be utilized in grades K-12
4. A need for improved periodic tables for demonstrating the relationships which are obvious in print tables
5. A need for science resource manuals for teachers of the visually impaired
6. A continuing need for APH to identify and purchase commercially-available materials which may have utility or may be modified for use by visually handicapped students
7. A need to continue the biological models series to include human cell types, plant and animal cells, budding, regeneration, fission, and sexual reproduction

The meeting was conducted by Frank Franks.

#### Biological Models Development in Cell Division

Work completed during FY 1979. Fourteen prototypes were designed and constructed to portray the events occurring in meiosis. Symbols were identified for use on the models. Symbols varying from those used and tested for legibility on the mitosis models were identified. Two pseudomodels were constructed for use in legibility testing of these symbols. Results of the legibility testing was 100% correct identification of symbols by legally blind biology students.

Content material explaining the events in each phase were prepared by Ruth Gough, postdoctoral student at George Peabody College for Teachers, and by Rebecca Hunton, Indiana School for the Blind, who have assisted in the development of the materials. Frank Franks was the project director and Tony Siegel and Bob Glass were assistants. Bob Glass also assisted in preparation of the models.

#### Audio-Tutorial Reference Materials in Biology (Cell Division)

Work planned for FY 1980. As more and more physically handicapped students attend secondary day school programs and have greater accessibility to science and biology instruction, the need for them to function independently is accentuated. In an effort to meet this need, the APH has developed a number of biological models during the past 5 years. These models are tactile schematics in relief which present organizational plans of various plant and animal cells and structures. Current cell division (mitosis and meiosis) models include descriptions and commentaries on events occurring

in each developmental phase. There is an urgent need for audio-tutorial reference materials which blind and visually handicapped students can use without teacher assistance in the rapid-paced mainstream.

It is the purpose of this project to prepare and evaluate self-instructional modules consisting of models and tapes for independent use. The project also will result in a format and guidelines for the development of subsequent packages for upper elementary and secondary visually handicapped students and will have implications for other students with various handicapping conditions.

The project will utilize the cell division models--each depicting a developmental phase--and the accompanying written materials to develop the self-instructional program. The written materials will be reviewed and edited by APH staff to develop scripts. The scripts will be critiqued by prominent science educators for content and for vocabulary/reading level. The scripts then will be recorded by professional readers in the APH recording studio. A vocally-indexed glossary of biological terms will be developed and included on a separate tape.

Evaluation will consist of critiques by biology teachers in day and residential schools whose students use the materials and by legally blind students to determine the appropriateness of the programs as reference aids to instruction. APH has been awarded a National Science Foundation grant to complete this work. Frank Franks is project director and will be assisted by Ruth Gough, postdoctoral student at George Peabody College for Teachers, and by Rebecca Hunton, Indiana School for the Blind. Bob Glass is the APH assistant on the project.

#### Micro-Slide Cassette Program

Work planned for FY 1980. Few microscope materials are available in biology and general science for legally blind students who have useful amount of residual vision. Current emphasis on use of residual vision and on mainstreaming legally blind students were cited by participants in a National Needs in Science for Blind Students meeting (held in April 1979) in their endorsement of a micro-slide project. A micro-slide viewer and slides were examined by participants who felt that the materials have significant utility and implications for a large number of legally blind students with useful residual vision who are mainstreamed in science classes. Further, they supported the approach of adapting the materials for audio-tutorial, self-instruction. The use of tapes will allow the student to focus full attention on use of the microscope (visual inspection task) without having to shift from the large print or braille page (reading task) in a complicated two-step operation.

The slides, generally, present clear views of a variety of microscopic cross-sections and structures. Print letters, arrows, and brackets appearing on the microslides are clear and uncluttered. Individual letter size approach 18 point. Each lesson begins with a brief and simple introduction defining/



summarizing/explaining the term/process/phases presented. The magnification at which the photograph was taken is given in the introduction. Occasional diagrammatic information appears in the introduction. The text presentation for each slide includes specialized vocabulary (e.g., algae, which will be spelled out) and a summary of events or description and magnification of what is on the slide (e.g., DIATOM--200x--left side). Provocative questions often are included (e.g., How big is a virus?). The viewer is virtually unbreakable with normal use. A MACRO-lens<sup>TM</sup> attachment is available which converts the microscope for use in examination of solid objects up to 3/4 inch (2 cm). The regular print text and slide views will accompany a tape for the text. No adaptation for the viewer is necessary. The MACRO-lens<sup>TM</sup> attachment can be included if desired.

The principal objective of this project is the preparation of tapes of print lessons which are currently available to sighted students in regular classes. A subordinate objective is the collection of visual legibility data to determine the value of the accompanying slide photographs for low vision students. Teacher critiques of the materials and student interviews will complete the field evaluation. Frank Franks will be project director, assisted by Deborah Willis.

#### Annotated Bibliography of Science for Blind Students

Work planned for FY 1980. An annotated bibliography on science for blind students will be prepared which will focus upon (a) studies in which empirical data were collected and (b) articles related to teaching science to visually handicapped students. The bibliography will serve as a reference source for the Department of Educational Research. It will be done as an independent study project in the Graduate Education Program at the University of Louisville by APH research assistant, Bob Glass.

#### Social Science

##### Continental Relief Map Cassette Program

Work completed during FY 1979. In an effort to facilitate map study and to improve geographical concepts, some years ago APH developed six simplified continental relief maps. More recently APH has undertaken the development of audio-tutorial cassette tapes for use with these maps as supplementary/reference materials in social studies. These materials were developed to provide supplementary self-instructional materials for elementary and secondary blind students in social studies which:

1. Stimulate student interest in map study
2. Motivate blind students in doing reference and library study
3. Encourage blind students to relate social studies content to specific concepts through the use of the simplified relief maps

Three tapes were developed to accompany each relief map; North America, South America, and Europe. The first tape in each series includes an introduction and provides a guide for a systematic tactual exploration of the continent. The script reviews basic terms and relates them to actual features on the earth's surface. The second tape focuses on specific features of that continent, naming some of the important rivers, lakes, mountains, and other pertinent geographic features. The third tape in the series includes socio-historical information such as where people live, original patterns of settlement, location of important cities on the continent, and significant historic sites. Each tape is from 20-30 minutes in length.

Three cassette each for North America, South America, and Europe have been completed and evaluated. The evaluation included expert reviews, teacher critiques and interviews, and an empirical evaluation of student use. The North America tapes were evaluated in day school programs to determine the appropriateness of the format and content for mainstreamed blind students. Acceptance by teachers and students was gratifying with a number of teachers requesting permission to use the tapes and maps with their sighted classes. The North America tapes can be used with students as early as primary grades.

This project has been directed by Frank Franks. He was assisted by John Barth and Tony Siegel. Jack Miller, of George Peabody College for Teachers, has been responsible for writing the scripts and preparing the tapes.

Work planned for FY 1980. Early in 1980 evaluation of the South American and European tapes will be completed. This evaluation is being conducted in residential schools. Subsequently, tapes for Africa, Asia, and Australia will be completed and evaluated following procedures utilized with evaluation of the taped materials for the other continents.

## Tactile Graphics

### Needs Identification: Tactile Graphics

Emerson Foulke, Director of the Perceptual Alternatives Laboratory at the University of Louisville, held a workshop and symposium on Haptic Perception at the University on March 28-31, 1979. John Barth and Ed Berla', of APH's research staff, participated in the related activities. Other participants included persons from England, Canada, and the U.S. In preparation for this event, a set of tactile graphics addressing difficult tasks was prepared by APH, Recording for the Blind, the National Braille Association, Howe Press, the University of Warwick (England), the National Mobility Centre (England), and Machstat--maker of the Sensory Quill. During the workshop sessions, these graphics were critiqued by panels of blind users. From these critiques, researchable questions were identified and information was obtained as to how APH might improve their graphics, as produced in paper.

## Graph Studies

Work completed during FY 1979. A study was conducted to determine the effect of line type and display background on line-tracking, an important operation performed on tactile graphs. Line type was studied in terms of two of the most important parameters which distinguish one linear symbol from another: continuous-interrupted and thick-thin. This resulted in four lines being tested: (a) thin-continuous, (b) thin-interrupted (or dotted), (c) wide-continuous, and (d) wide-interrupted. All four were tested both against a smooth background and against a background of thin-continuous grid lines. All eight of these displays were embossed in a paper medium. Twenty-four braille students in grades 4-12 traced the lines from beginning to end (50 cm) as quickly as they could without departing from the line. Statistically, no effect of grade level on line tracking efficiency could be discerned. It was found, however, that a background grid had adverse effects on line tracking performance. On the average, it took students 129% longer to trace a line through a grid than through a smooth background. This occurred despite the fact that the lines composing the grid were only half as high as the lines embedded in them, were separated from those lines by approximately 3 mm, and were found to be discriminable from all four lines tested. None of these four lines escaped the distracting effects of the grid background. Furthermore, except for the thin-continuous line, no linear symbol was more trackable than any other when embedded in a grid. The thin-continuous line, differing from the grid lines only in elevation, was traced less efficiently than the others. In the condition involving a smooth background, neither line width, line continuity, nor any combination of these two factors had an effect on the ease of tracking. Subjective reports, however, revealed that students overwhelmingly preferred the thin dotted line to the other three.

From a practical viewpoint, the wide-continuous line (3.4 mm), which is not currently available to APH transcribers, was a success. It was found to be reproducible in a paper medium and comparable in trackability to the other lines tested. It, therefore, increases APH's pool of discriminable linear symbols. The thin-continuous line produced for this study can also be viewed as a potentially useful addition to APH's paper graphic productions. Prior to this experiment only a thin-continuous line of low elevation (.010 inch) was available and it was not known whether a continuous line of higher elevation could be successfully embossed in the .006 inch paper stock used. The embossing of a thin-continuous line twice as high in elevation (.020 inch) was found to be feasible. Moreover, in the discrimination testing phase of the experiment, several subjects commented on its "sharpness," an important attribute in tactual perception. This research was conducted by John Barth.

Work planned for FY 1980. Based on the tracking results of the study reported above, one would conclude that the use of a grid in a tactile graph should be avoided if possible. However, the tracing of a data curve to determine its general shape and trend is only one of the important operations that are typically performed on graphs. Another is point location, the precise determination of the coordinate values associated with points on the data curve. It is this operation which may necessitate the inclusion of



tactile grid lines. There is no information available, however, on blind students' accuracy in executing the various finger movements required in point location tasks, either with or without grid backgrounds. Systematic examination of the accuracy of these movements will thus be the focus of another research project in which 20 braille reading students from grades 5 and 6 will serve as subjects. The effects of the following variables on movement will be determined: (a) direction of movement, (b) length of movement, (c) presence and absence of a grid, and (d) presence and absence of an interfering line. John Barth will be responsible for this study.

### Graph Interpretation

Work planned for FY 1980. Because (a) the ability to use and interpret graphs is considered a basic skill important in mathematics education, (b) graphs are used extensively in every branch of science, industry, business, and government, and (c) no instructional materials for use of tactile graphics are currently available for visually handicapped students, the practicality of developing a systematic program of graph instructional materials for blind and partially sighted students will be explored. The first phase will involve the identification of skills and concepts important in graph interpretation as well as the identification of instructional programs for the sighted which might be adapted as part of such a program. During FY 1980 such skills and concepts will be identified and training materials for use by sighted students will be reviewed. John Barth will be responsible for this project. He will be assisted by Ed Berla'.

### Tactile Display Kit

Work completed during FY 1979. During this year specifications for the kit were determined. In doing so all available information on the topic from the literature was reviewed; knowledgeable individuals were contacted; and various tools, materials, and production methods were identified and evaluated. From this, it was determined that the most feasible and versatile method of constructing tactile graphics on an individual basis is to emboss them in heavy gauge aluminum foil. This foil "master" can then be used to produce the desired number of copies using a thermoform machine. Collaboration with a mechanical engineer/designer proved valuable in specifying embossing tools that could be constructed to meet the requirements of the kit. John Barth was responsible for this work.

Work planned for FY 1980. Several prototype kits will be assembled. They will include tools and materials for the construction of tactile graphic displays and a user's manual. The manual will be composed of the following three sections: (a) introduction to, and proper use of, the kit's tools and materials, (b) information for designing and constructing legible tactile displays, and (c) information for use in training students to read tactile displays. These prototype kits will be sent out for a limited field evaluation. Based on these evaluations, revisions will be made. Ten additional kits will be compiled and these will be sent to

teachers and volunteer workers in the field for evaluation in use. Legibility testing of the symbols employed in the kit will also be conducted. Final revisions to the materials will be made as needed. John Barth will be responsible for this project. He will be assisted by Gary Davis, a mechanical engineer/designer with APH, and Ed Berla'.

### Plate Embossing Apparatus

Work planned for FY 1980. A new system for embossing metal plates with graphic patterns (maps, graphs, diagrams, charts) will be designed and constructed. The device envisioned will offer several advantages over the current system; namely: (a) it will have the capability of producing a greater number of linear symbols semi-automatically, (b) it will reduce variability in symbol height, (c) it will allow for the precise embossing of several levels of relief, (d) it will increase operator efficiency and reduce fatigue, (e) it will be much quieter in operation, and (f) it will be more versatile and controllable. Although symbols selected for application with this device will be based on previous research conducted by APH, legibility testing of the point, linear, and areal symbols producible by this device will be conducted upon its completion. John Barth and Gary Davis, a mechanical engineer/designer with APH, will be responsible for this project.

### Educational Measures

#### Needs Identification: Educational Measures

Work completed during FY 1979. A meeting was held in Louisville on March 6 and 7, 1979, with eight consultants attending, to examine needs and priorities for educational measures for visually handicapped students. Prior to the meeting, major test publishing companies had been queried and had identified those educational tests most widely used on a national basis. The tests so identified were ordered and were on hand for inspection at the meeting. Other information presented at the meeting included a report by Mary K. Bauman on the results of a national survey she had just completed regarding tests currently being used by psychologists with visually handicapped persons; lists of tests identified by other professionals working in the field as useful with visually handicapped persons; and APH sales of tests produced in braille, large type, by the large type--short run process, and by vacuum forming volunteer transcribed masters. Needs areas were identified and individual tests critiqued in terms of usefulness and feasibility for adaptation.

Areas of test needs identified were: (a) a developmental scale of visually handicapped children, (b) a current achievement series--the 1973 Stanford Achievement Series has been well received but will soon be outdated, (c) a diagnostic reading test, (d) a diagnostic mathematics test, (e) a braille reading comprehension test that can be administered quickly as a screening device, (f) an auditory discrimination measure, (g) a mechanical aptitude

test, and (h) a performance measure--possibly extending the norms for the Raven's Progressive Matrices downward would meet this need.

In addition to reviewing test needs, some mechanics of test adaptation and use were considered. These included how money pictured in the print edition of a test should be handled in the braille edition, how maps and other graphics should be handled in braille editions, use of electronic calculators in mathematics tests, and use of both braille and large type answer sheets. Bill Duckworth and June Morris organized this meeting.

### Test Adaptation

Work planned for FY 1980. Pending publisher approval, work will be initiated to adapt two diagnostic tests for braille and large type during the year. As identified by the test needs group, they will be the KeyMath Diagnostic Arithmetic Test and the Stanford Diagnostic Reading Test. Additionally, APH personnel will work with The Psychological Corporation, publisher of the Stanford Achievement Test series, in the item selection phase of the next Stanford Achievement Series, slated for publication in 1982. By so doing, the number of items included in the print edition of this series not suitable for braille should be reduced, meaning the final print and braille editions should be quite similar. Bill Duckworth will be responsible for preparation of copy for the braille and large type editions of these tests and for the preparation of directions specific to administration of the braille and large type editions.

### Other Research

### Educational Games

Work conducted during FY 1979. The purpose of this project is to provide educational games for young, visually handicapped children. This is being done by adapting two commercial games, Silly Sandwich and Sneaky Snake, and by developing a game kit of materials which can be used to adapt or create educational games. Previous testing revealed little difference in the discriminability of four possible tactile symbols for "kitty" and "puppy" to be used in the Silly Sandwich game. Therefore, additional testing was done to determine which symbols were more easily associated with "kitty" and "puppy." Since previous adaptations of Sneaky Snake had proved to be unacceptable, this game was completely redesigned. Four adult blind persons were then observed using this adaptation. The training procedures were revised based on these observations before the game was field tested. A tactile spinner for the game kit was designed and successfully tested for legibility. The following game parts were then located and purchased or designed and made for the game kits:

spinner with four different faces  
embossed dice and large dice



storage box with lid for rolling dice  
three open-ended game boards  
discard/draw rack  
hand-held card holders  
blank cards  
six tactile tokens with stands  
Educational Games for Visually Handicapped Children by Patricia A.  
Gallagher  
"Suggestions for Using the Game Kit"

Preparations were made for placing the kits in the field with expert reviewers for use with visually handicapped children. Eleanor Pester was assisted by Deborah Willis and Tony Siegel on this project.

Work planned for FY 1980. There are three major objectives for the completion of this project. The first is to field test the most recent adaptations of Silly Sandwich and Sneaky Snake with pairs of normal and visually handicapped children, ages 6 through 8. Next, the game kit will be evaluated by placing it in the field for use with visually handicapped children and for expert review. Finally, additional information about the work that has been done to adapt games for the visually handicapped will be acquired and then organized for distribution. Eleanor Pester is directing this project.

### Special Lamp Project

Work completed during FY 1979. Letters to Dr. Carson Nolan suggested a need for a lamp which would provide dimmer control. In November of 1978, a search was made for such an item. The American Foundation for the Blind has in its Aids and Appliances Catalog a High Intensity Lamp (MC365) which retails for \$30.95. This lamp was purchased and has been evaluated.

For many years, the Dazor Manufacturing Corporation of St. Louis, Missouri, has made available three Floating Arm Magnifiers. These lamp magnifiers were actually designed for industrial use, but have proved of benefit to those needing some magnification.

APH has pursued the possibility of making available some such lamp magnifier which would be of use to the individual with a need for some magnification and controlled light. Two Dazor lamps were purchased. Bausch-Lomb, makers of highest quality lenses, were contacted as to greater magnification in a 5-inch diameter. Such a lens, hopefully, would make possible the viewing of one entire column of a two-column page, even in enlarged print. However, nothing was found which would meet this criterion.

Meanwhile, a sample lamp was sent to APH by an interested trustee. Pursuing this excellent lead, two lamps have been developed. Both have controlled lighting through rheostats. One is an incandescent lamp; the second is a fluorescent lighted magnifier. Amie Dennison was responsible for this project.

### Relationship between Visual Acuity, Reading Mode, and School Systems for Blind Students--A 1979 Replication

Work planned for FY 1980. The purposes of this study will be to determine the reading medium(s) being used by legally blind students having varying degrees of vision and to learn where these students are being educated and at what grade levels. Analyses will be based on data from the 1979 registration of legally blind students through APH. The study will be a replication of previous studies based on similar data for 1960, 1963, 1966, 1969, 1972, and 1976, respectively. Comparisons of the 1979 data with that from the earlier studies will help identify trends in educational practices for this population. Deborah Willis will conduct this study.

### Academic Achievement of Legally Blind Students

Work planned for FY 1980. The primary objective of this project is to determine if legally blind students in grades 2 through 6 are performing academically at grade level, as measured by the Stanford Achievement Test. The students to be included in this study will be enrolled in academic programs in public and residential schools.

In order to accomplish this objective, many schools and school systems that have purchased the Stanford Achievement Test in braille or large type during the past 3 years will be contacted and asked if they would be willing to participate in the study. Of those who agree, it will be requested that (a) either the investigator be allowed to visit for the purpose of recording available data or (b) the school or school system have its staff record this information and submit it to the investigator using data forms supplied by the investigator. This information will provide a means for determining achievement levels in all areas assessed by the Stanford Achievement Test Series. Such information can then be related to grade norms. Analyses will be run to determine whether differences found are significant.

The second objective of this project will be to determine specific concept areas in mathematics where deficiencies exist. This information will be obtained from an item analysis or responses to the math tests included in the Stanford Achievement Test Series by legally blind students in grades 2 through 6. Findings will be applied in the subsequent development of mathematics materials specifically addressing deficit areas. Both studies will be conducted by Deborah Willis. Their successful execution will depend on the cooperation of various schools and school systems serving legally blind students.

### Application of Listening Research

### Recorded References for the Visually Impaired and Other Handicapped

The largest single project ever undertaken by APH is the production of a recorded edition of The World Book Encyclopedia. The complete package will

include a special cassette player with an indexing capability and a set of volumes which will contain cassettes and written indexes, in both braille and large type. The indexes will provide access information to the recorded content. The project is an application of previous research conducted by APH. Many division of APH are involved in this project. The Department of Educational Research is responsible for preparation of the text for recording, preparation of copy for the written indexes, and overall coordination of the project.

Work completed during FY 1979. Funds for this project became available from BEH October 1, 1978. During the early months, specifications and procedures for editing The World Book Encyclopedia for recording were developed. This was done in close collaboration with the editorial staff of World Book. After one complete volume was edited for recording, it was reviewed by World Book editorial staff. Subsequently, the editing specifications were modified. The initial volume was reedited to incorporate these changes and subsequent volumes were prepared accordingly. Three new studios were installed and especially equiped at APH during the early months of 1979 to accomodate recording, which commenced in May 1979. Preparation of copy for the written indexes was initiated shortly thereafter.

Work planned for FY 1980. Since the scope of this project is large and involves many of APH's operations, weekly in-house meetings will be held to insure all phases of the project are coordinated. The production schedule calls for editing to be completed by mid-February 1980, recording by the end of March 1980, and preparation of copy for the written indexes by late April 1980. Production of the special indexing player will start in January 1980. The target date for availability of the recorded edition of The World Book Encyclopedia is September 1980.

Research personnel involved in this project during FY 1979 were Sharon Goldblatt (Bensinger), Patricia Campbell, Mark Craven, Nancy Stivers, and June Morris. With the exception of Mrs. Campbell, the same persons will be working on it during FY 1980 when they will be joined by Kerry Cundiff. But, just to acknowledge these persons is inadequate; for persons throughout APH are playing roles that are vital to the fruition of this project, and members of World Book's editorial staff continue to play an active role. Without the support of BEH, such an undertaking would not be possible. Dr. Carson Nolan, President of APH, serves as Project Director for this undertaking.



Agencies Participating in Research during FY 1979

Many individuals, schools, and agencies have taken part in activities supportive to the work being done by the Department of Educational Research. Without this splendid spirit of cooperation from the field, it would not be possible to maintain an ongoing research program such as the one described in this report; for it is essential that the students and staffs for whom APH's materials are designed be involved in their development.

Auburn University Outreach Program; Auburn, Alabama  
Board of Cooperative Educational Services; Suffolk County, New York  
Boston City Schools; Massachusetts  
Butterfield School; Lombard, Illinois  
Central Wisconsin Center; Madison  
Chicago Lighthouse for the Blind; Chicago, Illinois  
Child Study Center; Oklahoma City, Oklahoma  
Cincinnati City Schools; Ohio  
Dayton City Schools; Dayton, Ohio  
Dearborn Heights School; Oak Lawn, Illinois  
DeKalb County Public Schools; DeKalb County, Georgia  
Easter Seal Society of Bear County; San Antonio, Texas  
Einstein School; Hanover Park, Illinois  
Employment and Training Center; Anchorage, Alaska  
Fairfax County Schools; Annandale, Virginia  
Florida School for the Deaf and the Blind; St. Augustine  
Frances Blend School; Los Angeles, California  
Georgia Academy for the Blind; Macon  
Hamilton County Schools; Ohio  
Harahan Parrish Schools; Harahan, Louisiana  
Hillwood Presbyterian Church Day Camp for the Visually Handicapped;  
Nashville, Tennessee  
Indiana School for the Blind; Indianapolis  
Jefferson County Public Schools; Louisville, Kentucky  
Johnson Elementary School; Denver, Colorado  
Kennedy Elementary School; Medford, Massachusetts  
Kentucky School for the Blind; Louisville  
Lakeview Jr. High School; Downers Grove, Illinois  
Manchester School District; New Hampshire  
Merrimack Valley School District; New Hampshire  
Michigan School for the Blind; Lansing  
Midland Independent School District; Midland, Texas  
Missouri School for the Blind; St. Louis  
Multiple Handicap Center of Penobscot Valley; Bangor, Maine  
Mur-ci Home for Children; Nashville, Tennessee  
NEGA CESA; Winterville, Georgia  
New Jersey Commission for the Blind, Newark, New Jersey  
New York State School for the Blind; Batavia  
Oak Hill School; Hartford, Connecticut

Oakland Public Schools; Oakland, California  
Ohio State School for the Blind; Columbus  
Orleans Parrish Schools; New Orleans, Louisiana  
Pasadena Unified School District; Pasadena, California  
Philadelphia Public Schools; Philadelphia, Pennsylvania  
Portland Public Schools; Portland, Oregon  
Ross School; San Diego, California  
Schweitzer Elementary School; San Diego, California  
Seattle Lighthouse for the Blind; Seattle, Washington  
Shawnee County Cooperative; Topeka, Kansas  
St. Joseph's Infant and Maternity Home; Cincinnati, Ohio  
Tennessee School for the Blind; Nashville  
Texas School for the Blind; Austin  
The W. Ross Macdonald School; Brantford, Ontario, Canada  
Therapeutic Living Center; Pasadena, California  
Tyler Elementary School; Washington, D. C.  
Upsal Day School; Philadelphia, Pennsylvania  
Vista Unified District; Vista, California  
Washington State School for the Blind; Vancouver, Washington  
West Suburban Association; Lombard, Illinois

Consultants during FY 1979

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Auditory Nerf Ball

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Mrs. Sali LeVan, Upsal Day School for Blind Children, Philadelphia, Pennsylvania

Miss Linda Major, Fairfax County Public Schools, Annandale, Virginia

Beginning Braille Reading Series

Mrs. Ruth Craig, Instructor (Retired), Brigham Young University, Springville,  
Utah

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago,  
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Dr. Philip H. Hatlen, Professor, Department of Special Education, San Francisco State University, San Francisco, California

Miss Freda Henderson, Teacher (Retired), Tennessee School for the Blind, Monkton, Maryland

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Dr. Evelyn Rex, Professor, Department of Special Education, Illinois State University, Normal, Illinois

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Flashlight and Penlight with Color Caps

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Miss Ginny Connor, New York State School for the Blind, Batavia

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Low Vision Stimulation and Training Materials for Developmentally Young  
Visually Impaired Students (0-36 months)

Mrs. Pat Carpenter, DeKalb County Schools, Scottdale, Georgia

Julie Jones, Ph.D., Texas Tech University, Lubbock

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Mrs. Donita Burkett, Child Study Center, Oklahoma City, Oklahoma

Miss Kathy Byrne, Child Study Center, Oklahoma City, Oklahoma

Miss Kathleen Walker, Child Study Center, Oklahoma City, Oklahoma



Miss Pam Wyatt, Harris-Hillman School, Nashville, Tennessee

Wendy Dresek, Ph.D., Easter Seal School of Bear County, San Antonio,  
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Materials for Fine Motor Skill Development: Manipulative Tray and  
Activity Center

Mr. Jim Fuller, Toy Safety Engineer, U.S. Testing Co., Hoboken, New Jersey

Mr. Frank Pepe, Toy Safety Engineer, U.S. Testing Co., Hoboken, New Jersey

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Mathematics

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Metric Measurement Materials and Aids

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Mr. Noel B. Croft, Project Director, Vision-Up, Boise, Idaho

Miss Bobbie Donald, Itinerant Teacher, Boise, Idaho

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Mrs. Donna Heiner, Project Outreach, Ingham Intermediate School District, Mason, Michigan

Mr. David Hutchinson, Teacher, Bellingham, Washington

Dr. Berthold Lowenfeld, Berkeley, California

Mrs. Irna Marshall; Child and Family Specialist, Washington State Commission  
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Miss Pauline Moor, New York, New York

Mr. Frank Penland, Director, Virginia Commission for the Visually Handicapped  
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Miss Mary Ritzema, Itinerant Teacher, Pocatello, Idaho

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Needs Identification: Educational Measures

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Mrs. Ann Stoddard, Prevocational Specialist, Mountain Plains Regional  
Deaf-Blind Center, Denver, Colorado

Mr. Charles Zemalis, Supervisor of Deaf-Blind Prevocational Services,  
California School for the Blind, Berkeley

#### Field Evaluators:

Mr. Clyde Barrington, Employment and Training Center, Anchorage, Alaska

Mr. Ed Bouchea, Multiple Handicap Center of Penobscot Valley, Bangor, Maine

Mr. Dennis Gustafson, Chicato Lighthouse for the Blind, Chicago, Illinois

Mr. Joel Hoff, Florida School for the Deaf and the Blind, St. Augustine

Miss Darrell Konrad, Seattle Lighthouse for the Blind, Seattle, California

Mrs. Nancy Messinger, Texas School for the Blind, Austin

Mr. Mike Minihane, Oak Hill School, Hartford, Connecticut

Mr. Alan Puzarne, Therapeutic Living Center, Pasadena, California

#### Recorded References for the Visually Impaired and Other Handicapped

Mrs. Nancy F. Ham, former Editorial Assistant, World Book-Childcraft  
International, Chicago, Illinois

Miss Susan Kilburg, Secretary to Dr. Nault, World Book-Childcraft International, Chicago, Illinois

Dr. William H. Nault, Executive Vice-President and Editorial Director, World Book-Childcraft International, Chicago, Illinois

Revision of the Utilization of Low Vision Kit

Mrs. Joyce Bromley, Sight Conservationist, Materials Center for Visually Handicapped, Knoxville, Tennessee

Mrs. Pat Carpenter, Educational Consultant, Visually Impaired Program, DeKalb County School System, Scottdale, Georgia

Dr. Hilda Caton, Vision Impairment Program, University of Louisville, Louisville, Kentucky

Ms. Marcia E. Collins, University of Texas, Austin, Texas

Mrs. Ruth Holmes, Educator and Consultant, Illinois School for the Visually Handicapped, Jacksonville, Illinois

Mrs. Carla McMillin, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Mrs. Jan Moseley, Implementation Specialist, Low Incidence Programs, Jefferson County Public Schools, Louisville, Kentucky

Dr. Earl F. Rankin, University of Kentucky, Lexington, Kentucky

Dr. Rona Willen Shaw, Institute of Child Study, Kean College of New Jersey, Union, New Jersey

Mrs. Rose Skolnick, Head, Vision Stimulation Program, Overbrook School for the Blind, Philadelphia, Pennsylvania

Dr. Dean W. Tuttle, University of Northern Colorado, Greeley, Colorado

Teacher Evaluators:

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Mrs. Barbara Bray, Teacher, Washington State School for the Blind, Vancouver, Washington

Mrs. E. J. Chorniak, Elementary Principal, The W. Ross Macdonal School, Branford, Ontario, Canada



Miss Nan Cookus, Itinerant Teacher, Shawnee County Cooperative, Topeka, Kansas

Ms. Georginanna Farrer, Itinerant Teacher, Merrimack Valley, New Hampshire

Mrs. Jane Frederick, Multiply Handicapped Visually Impaired Teacher, DeKalb County, Georgia

Ms. Teresa Hritcko, Itinerant Teacher, Manchester School District, New Hampshire

Mrs. Carol Kaufman, Itinerant Teacher, Portland Public Schools, Portland, Oregon

Mrs. Pat Knox, Itinerant Teacher, Midland Independent School District, Midland, Texas

Mr. Jeff Lichter, Itinerant Teacher, Portland Public Schools and Regional Program for Visually Handicapped, Portland, Oregon

Mrs. Phyllis Miron, Itinerant Pre-12 Teacher, Board of Cooperative Educational Services, Suffolk County, New York

Mrs. Nita Ramage, Itinerant K-12 Teacher, Oakland Public School, Oakland, California

#### Science

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Dr. Ken Ricker, Associate Professor, Science Education, University of Georgia, Athens, Georgia

Dr. Ronald Simpson, Associate Professor, Science Education, North Carolina State University, Raleigh, North Carolina

Dr. Irwin Slesnick, Professor of Biology, West Washington University, Bellingham, Washington

#### Tactile Display Kit

Mrs. Nancy Amick, Head Transcriber and Supervisor, Recording for the Blind, Trenton, New Jersey

Two- and Three-Dimensional Relationships

Ms. Joy Craig, Resource Teacher, Washington Park School, Cincinnati, Ohio

Mr. Anthony Evancic, Mathematics Teacher, Philadelphia Public Schools,  
Philadelphia, Pennsylvania

Mr. Dana Jackson, Resource Teacher, Washington Irving Middle School,  
Rosindale, Massachusetts

Dr. Jack Price, Superintendent, Vista Unified School District, Vista,  
California

Mr. Tom Ridgeway, Mathematics Teacher, Georgia Academy for the Blind,  
Macon, Georgia

Ms. Debi Ruth, Itinerant Teacher, Vista Unified School District, Vista,  
California

Mr. Tuck Tinsley III, Mathematics Teacher, Florida School for the Deaf  
and Blind, St. Augustine, Florida

Ms. Marsha Williams, Itinerant Teacher, Vista Unified School District, Vista,  
California

Ms. Janet Wood, Resource Teacher, Harahan Elementary School, Harahan,  
Louisiana

Research and Development Personnel for FY 1979

|                          |                                |
|--------------------------|--------------------------------|
| Anderson, Diane          | Administrative Assistant       |
| Barth, John, PhD         | Research Scientist             |
| Berla', Edward, PhD      | Research Scientist (part time) |
| Bortner, Sheri MS        | Research Scientist             |
| Campbell, Patricia, BA   | Research Assistant             |
| Caton, Hilda, EdD        | Research Scientist (part time) |
| Craven, Mark, BA         | Research Assistant             |
| Dennison, Amie, MA       | Librarian/Research Associate   |
| Duckworth, Bill, MS      | Research Scientist             |
| Franks, Frank, EdD       | Research Scientist             |
| Frere, Suzette, BA       | Research Assistant             |
| Glass, Robert, BS        | Research Assistant             |
| Goldblatt, Sharon, BS    | Research Assistant             |
| Morris, June, MA         | Director                       |
| Pester, Eleanor, MS      | Research Associate             |
| Siegel, Anthony, BA      | Research Assistant             |
| Simpkins, Katherine, PhD | Research Scientist             |
| Williams, Luella         | Library Clerk/Clerk Typist     |
| Willis, Deborah, BA      | Research Assistant             |

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Temporary personnel:

|                                    |                    |
|------------------------------------|--------------------|
| Anhouse, Karen                     | Clerk              |
| Bort, Delia, MEd candidate         | Research Intern    |
| Kapp, Mary Ann, MEd                | Research Assistant |
| McMillin, Carla, MA                | Research Assistant |
| Segovia, Mercia, PhD               | Research Assistant |
| Stivers, Nancy, AB                 | Research Assistant |
| Surbuts, Barbara,<br>MEd candidate | Research Intern    |



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- Caton, H., & Bradley, E. J. A new approach to beginning braille reading. Education of the Visually Handicapped, 1978-79, 10, 66-71.
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DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES  
FISCAL 1980

**American  
Printing House  
for The Blind  
Incorporated**

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The Department of Educational Research at the American Printing House for the Blind (APH) has maintained a full and productive schedule during FY 1980. Research and development activities have been underway in the areas of early childhood and multihandicapped, low vision, reading, mathematics, science, social studies, tactile graphics, educational measures, and educational games. At the same time, other studies have addressed problems relating to the design and use of tactile graphs, have looked at the complex relationship between degree of vision and mode of reading, and have queried academic achievement of legally blind students. Overall, projects are progressing as anticipated and are on schedule.

Resources to support research and development projects beyond the federal appropriation continue to be a concern. Support was received during the year from the Bureau of Education for the Handicapped (BEH), now included in the new Office of Special Education, for the "Revision of the Utilization of Low Vision Kit" and "Recorded References for the Visually Impaired and Other Handicapped." Most of the production costs of the software for The World Book Encyclopedia, Recorded Edition are being paid under this latter grant. Additionally, work done on "Audio-Tutorial Reference Materials in Biology" was funded under a National Science Foundation grant. During FY 1980 two proposals were submitted requesting support from appropriate agencies for projects that were subsequently funded. One of these, submitted under BEH's Handicapped Research and Demonstration Program, will support a project entitled "The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers"; the other, submitted under BEH's Handicapped Media Services and Captioned Films Program, will support a project entitled "A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children." In the light of today's inflationary spiral, it is imperative that resources beyond the Department's annual federal appropriation be found if the Department is to maintain its current level of activity.

Several staff changes have occurred during this past year. Amie Dennison, who most recently has been working on the Revision of the Utilization of Low Vision Kit project and as Librarian of the Department's library, retired at the end of November. Bill Duckworth, a member of the research staff and a trained librarian, has assumed responsibility for the library. Staff needs now include someone with both expertise and experience in low vision. Another major change was the establishment of a Design and Development Section. The need for such a section has been apparent for some time. It will serve the Department in the development of models that are production engineered and in liaison activities with the Production Department.

Members of the research staff have enjoyed a close and positive working relationship with the Production Department since its reorganization. Input from production people during the early stages of a product's development saves many steps further down the road. Cooperation could not be greater than that which has been extended. During this period of time the Department of Educational Research has been greatly involved with four new products in the production stage which resulted from research endeavors. These include: Patterns: The Primary Braille Reading Program; The World Book Encyclopedia, Recorded Edition; the Program To Develop Efficiency in Visual Functioning; and the Tactile Graphics Kit. At the same time, liaison activities are ongoing for some products already in production, such as the Sensory Stimulation Kit.

Although research staff members have on occasion presented workshops in the past, during FY 1980 these activities were greatly enlarged. Thirteen workshops were presented on APH's preschool materials and nine on Patterns. It is anticipated that these activities will be continued in the coming years.

As in Fiscal 1979, the Educational Research and Educational Aids Committees met jointly in the spring of the year. This procedure appears to be working well and will be continued. By meeting in the spring, committee members are able to review projects being planned for the upcoming year and provide timely input that can be incorporated in the planning. Also, it is expedient to have the two committees meet jointly as their responsibilities overlap.

Following are brief descriptions of projects that are underway and that are anticipated.



## Early Childhood and Multihandicapped

### Sensory Stimulation Kit

Work completed during FY 1980. The research staff continued to provide ongoing consultation and support to the Production Department. Videotapes, available on loan from APH illustrating the sensory materials being used with multihandicapped visually impaired (mhvi) students, have been in much demand. Numerous presentations and teacher training workshops have been given by APH project staff on the use of the Sensory Stimulation Kit items and accompanying software. Sheri Moore continued to direct this project.

### Flashlight and Penlight with Color Caps

Work completed during FY 1980. The flashlight and penlight with color caps were released for sale in November 1979. The flashlight has five translucent color discs (white, yellow, blue, red, green); the penlight has five translucent color caps with rubber fittings (white, yellow, blue, red, green) and four transparent color caps (yellow, red, blue, green). A set of 5 X 8 inch (13 X 20 cm) cards, outlining a wide range of suggestions for using the flashlight and penlight, accompanies the items. These cards, containing 75 activities, state behavioral objectives as well as cautions regarding proper use of the penlight and flashlight. The cards cover activities for children functioning from birth through the primary elementary grades (1-3). They are organized into four graduated levels of responsiveness: tolerance, identification, exploration/selection, and discrimination. Sheri Moore directed this project.

### Prevocational Materials Development

Work completed during FY 1980. At the APH Annual Meeting in October 1979 the Prevocational Skill Development Materials were presented for production approval. They were unanimously accepted by the Educational Aids Committee. The development of these prevocational materials for higher functioning mhvi students was deemed first priority in an mhvi needs assessment conducted by APH in April 1979. The approved items included:

1. Paper folding jig
2. Round bottle (screw on/off top) jig
3. Square bottle (screw on/off top) jig
4. Nut/bolt/washer board
5. Nut/bolt/practice boards (three size gradations)
6. Advanced assembly and sorting tray (interchangeable horizontal and vertical dividers)
7. Software

The prevocational materials were field tested in late summer and early fall 1979 with mhvi students who had acquired basic language, motor, and self-help skills. Field testing sites included schools for the blind, public schools, private agencies, institutional programs, and rehabilitation agencies. Ten sites participated in the field testing, which involved over 100 mhvi students. Student data and teacher evaluation data were collected. Teachers using the materials completed evaluation forms that were used to document the effectiveness and

quality of the prevocational materials. Data collected included information on the manipulability of the prevocational materials, durability, safety, interest level of the students in similar materials, effectiveness in teaching identified skills, and the value of accompanying written materials. Both the tangible apparatus and the accompanying written materials were critiqued by the field test teachers. APH staff introduced the materials to the teachers and explained testing procedures and evaluation. Project personnel assisted the program staff in collecting the student data.

An innovative use of the Prevocational Consultant Committee was piloted with this project. Instead of convening as a group in Louisville, each committee member worked with an APH project staff member in field testing the materials at one of the 10 evaluation sites. This procedure gave the committee members first-hand experience with the Prevocational Skill Development materials. This use of committee personnel was rated highly successful by APH project staff, field testing sites, and the committee members.

Based on the field evaluation data collected, final revision was made on the prevocational materials. An additional set of the materials was prepared and subsequently submitted to the U.S. Testing Company, Inc. in Hoboken, New Jersey for product safety and durability tests. Each item was tested for conformance to the requirements of Title 16, Chapter II, Federal Hazardous Substances Act Regulations, "Test Methods for Simulating Use and Abuse of Toys, Games and Other Articles Intended for Use by Children." The U.S. Testing evaluation found no safety or durability problems with any of the Prevocational Skill Development materials. In addition, final expert reviews were conducted by two professionals familiar with developing prevocational skills in mhvi students. Neither of the reviewers was previously involved with the project. Based on their reports, minor changes were made in several software components. The Prevocational Materials Development project formally entered the production pipeline during July 1980. Suzette Frere and Bill Duckworth assisted Sheri Moore in this project.

#### A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Work planned for FY 1981. A 1979 APH needs assessment, dealing with the infant and preschool level child, prioritized materials to assist parents of visually impaired children functioning from birth to 2 years through critical development stages. To meet these needs, the research staff conceptualized a package of tangible, written, and recorded materials for use in stimulating such developmental "milestones" as reaching, grasping, bringing hands to the midline, and object permanence. An audio portion of the package would consist of two cassette tapes, illustrating appropriate parent/child interactions. A teacher guidebook would contain activities, objectives, and guidelines in using the materials package.

A proposal requesting federal grant monies was submitted to BEH under the Handicapped Media Services and Captioned Films Program. In September 1980, APH was notified that the grant proposal, A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children, was fully funded for the requested 2 year period.

Work on the new project will begin in November 1980 with a literature review. The first phase of the project will involve clarification of where in the developmental process the visually impaired infant begins to fall behind his sighted peers. Comprehensive research of the literature, parent interview sessions, and committee meetings involving teachers of young visually impaired children will be the main sources of information. The next step, after determining priority areas of need, will be to design appropriate aids to assist in the remediation of these developmental lags. Specifications will be written for the tangible items, the audio components, and the software. A toy designer will be consulted for design assistance. In addition, an audio recording specialist will assist in developing the recorded materials. A first draft of the software will be completed by October 1981. Sheri Moore will be project leader, assisted by Suzette Frere and Sharon Bensinger.

### Low Vision

#### Vision Stimulation and Training Materials (VS & TM) for Developmentally Young Visually Impaired Students (0-36 months)

Work completed during FY 1980. Work has proceeded on several phases of the VS & TM: the visual development sequence chart, the formative evaluation of the black light materials, the adaptation of additional commercial materials, and the design and construction of APH-developed items.

During FY 1979, literature and curriculum reviews were undertaken in the area of vision stimulation for developmentally young students. An extensive review of the development of vision in normal children was conducted (target: birth to 36 months). From the information obtained through this review, a comprehensive chart of visual development from birth through 36 months has been developed. References are cited for each developmental task listed. A second column is included listing educational materials useful in developing specific visual functioning tasks at the various developmental levels. Two expert reviews have been conducted on the visual development sequence and educational materials chart. As a result of these reviews, considerable revisions and additions were made to the chart. Particular effort has been made to include the most current research available and to include pertinent information from a variety of disciplines. Presently, the revised Visual Development Sequence chart is being edited by Mrs. Amie Dennison.

The project is divided into three components for the formative evaluation: commercial items with high visual interest and APH-adapted commercial materials; fluorescent materials for use in black light environment; and original materials planned and developed by APH staff. During late 1979 and early 1980, the commercial items with high visual interest and the APH-adapted commercial materials were formatively evaluated. Also, the black light and fluorescent objects were used by APH project staff at three program sites to determine their potential for further development. Dr. Marvin Efron, an optometrist from Columbia, South Carolina, worked closely with project staff on the development of the fluorescent environment and black light objects. Subjects utilized in the testing were infant, preschool, and mhvi with an overall functional level of birth to 36 months. Sites included residential schools for the blind, private agencies, and public school programs, and were selected on the basis of having competent



teachers motivated to provide their developmentally young students with vision stimulation experiences.

Extensive teacher evaluations were used in both formative evaluations to gain information for revisions. Information was elicited concerning the developmental level for which the materials are most appropriate; vision stimulation materials currently used; the relative interest level of the materials for the students, ratings for each material; improvements to be incorporated into the revision of the materials; suggestions for additional items and related written material, durability, construction, and safety of the materials; and so on. The data were analyzed and compiled from the testing of the commercial items, including those with adaptations. Evaluation results of the black light and fluorescent materials were very positive.

As the VS & TM program was originally planned, the black light materials were not included as a component. However, due to the enthusiastic response of formative test teachers and project staff, it was decided to concentrate development efforts on black light materials. Throughout 1980, the black light component has mushroomed into a full-scale project. Work has continued on revising and expanding the fluorescent colored materials for use under black light. Student activities have been written for each item, as well as a section on guidelines for using black light. Lamps holding the black light tubes have been modified; also, a lower wattage, more portable lamp has been added to accommodate home-based teachers. This expanded kit of materials will be field tested in seven programs from mid July to mid September. Cooperating teachers will complete a 38 page questionnaire to determine necessary revisions, deletions, and additions to this set of materials.

Work planned for FY 1981. Data returned from field testing sites will be compiled and analyzed by project staff, and materials will be revised as results indicate. If no major revisions are required, the black light materials will be presented at Annual Meeting 1980 for production approval. A final editing of the software will take place before submitting all materials to expert reviewers. As with other APH materials, the black light items will undergo extensive safety testing at U.S. Testing Laboratory in Hoboken, New Jersey.

The remaining two components of the Vision Stimulation and Training Materials project--commercial items with high visual interest and original materials developed by APH staff--will be closely examined before work proceeds. In keeping with a decision to de-emphasize commercial materials, the feasibility of a kit of commercial materials and adapted commercial materials will be reviewed. The need for original materials in the training of residual vision of developmentally young children will also be reassessed. Sheri Moore will continue to direct the VS & TM project. She will be assisted by Sharon Bensinger and Suzette Frere.

#### Light Box and Accompanying Materials for Developmentally Young Students (0-4 years)

Work completed during FY 1980. In November 1979, questionnaires were distributed to 50 teachers of developmentally young visually impaired students to obtain their recommendations regarding the size and design of the light box

being developed at APH. An incandescent light box with a rheostat was built based upon their recommendations; however, it became unsuitably hot in spite of attempts to ventilate the box. Although a fluorescent lamp operates at cooler temperatures, project staff were told that a rheostat to dim a small fluorescent system, such as the light box, was not manufactured. After a search of rheostat manufacturers, however, such a product was located.

A number of items to accompany the light box were proposed by APH staff, consultants, and teachers, and were assembled. These include:

1. Colored acetate backgrounds in a fiberboard frame
2. Patterned fabric backgrounds in a fiberboard frame
3. Fiberboard tracing sheets
4. Plexiglas spinner
5. Patterns for plexiglas spinner
6. Plexiglas rattle with colored beads
7. Colored plexiglas circles
8. Colored plexiglas ball puzzles with knobs
9. Colored plexiglas face puzzle
10. Colored plexiglas shape inserts with knobs and rubber frames
11. Colored transparent plastic tumblers
12. "See-Thru-Threading Shapes" (large colored transparent plastic beads)

Many of the items are designed to be used in combination with one another; for example, a colored acetate background may be inserted behind a tracing pattern to produce a brightly colored wavy line for the child to trace with his finger. Numerous other items will be suggested for use with the light box in a special section of the software; most of these will be easy-to-obtain commercial items or teacher-made materials (e.g., colored transparent peg set from Childcraft, colored markers, rattle made of transparent bottle). Guidelines and Activities for using the light box and accompanying items will be included with the materials.

Work planned for FY 1981. A fluorescent light box with a rheostat will be designed, built, and evaluated. Specifications include that the light box not overheat, that it fall within recommended size limitations (measuring approximately 24 X 15 X 5 inches [61 X 38 X 13 cm]), that it be lightweight and portable, that it provide even illumination, and that it dim smoothly. Additionally, it must be durable.

Following formative evaluation of the light box and accompanying items, all materials will be reviewed by project consultants, revised as needed, and readied for field testing. Suzette Frere is responsible for this project.

#### Revision of the Utilization of Low Vision Kit

Work completed during FY 1980. During the fall of 1979 a final field evaluation of this program, now called the Program to Develop Efficiency in Visual Functioning, was conducted. Program materials were placed with 14 teachers (8 public school and 6 residential school) for use over an 8-week period. Results indicated the content of the materials was useful and effective in training visual functioning. Subsequently, the program's written materials have undergone some revisions and have been prepared for publication by

a professional editor. This project was funded for a 42-month period by BEH, a period which terminated March 31, 1980. A 3-month extension was requested to facilitate production of the materials.

The program focuses on the effective use of low vision and provides for both assessment and instruction for improvement of visual functioning. Assessment items are keyed to instructional units. The program is based on the normal developmental sequence of vision and is designed for use with visually handicapped children and adults who evince a minimum mental age of 3 and have potential for learning. The program is designed for use by specialists in the education of the visually handicapped, especially low vision learners. Such persons need no special training in use of the program materials. These materials include three volumes (Diagnostic Assessment Procedure, Design for Instruction, and a Source Book on Low Vision), a Low Vision Observation Checklist, three optical aids, an assessment kit containing tangible and graphic materials needed for assessment, a record booklet, 150 lessons on cards, and graphic materials used with the lessons. Lists of commercially available materials that can be used with the program are included. The program will be available in the fall of 1980.

Project staff included Natalie Barraga of the University of Texas (Austin), and June Morris, Amie Dennison, Ed Berla', Deborah Willis, Sharon Bensinger, and Kerry Cundiff of APH. Eddy Jo Bradley, a professional editor, prepared the written materials for publication.

## Reading

### Beginning Braille Reading Series

Work completed during FY 1980. Development of Patterns: The Primary Braille Reading Program has gone well. The Readiness, Preprimer, and Primer level materials will be available for use during the 1980-81 school year. In order to familiarize persons working in the field with this new braille reading program, nine workshops were given during FY 1980. These ranged from 2 hours to 2 days in length.

Work planned for FY 1981. Students involved in the field evaluation of the program have progressed to the Book 2 and Book 3 levels. All students have completed the Book 1 level. Therefore, the Book 1 level materials can be finalized and will be made available for use by September 1981. The Book 2 and Book 3 levels will be produced in subsequent years as their field evaluations and revisions are completed. Fourteen workshops, of the 1-2 day type, are scheduled for FY 1981.

Hilda Caton and Eleanor Pester have been responsible for this project. They were assisted by Sharon Bensinger. Eddy Jo Bradley has served as the directing editor. Nancy Pitt, an APH stereograph operator, has worked with project staff in preparing the special braille plates required.

### Development of a Power Library

Work planned for FY 1981. The development of a Power Library is being considered for use in conjunction with Patterns: The Primary Braille Reading



Program. The Power Library would consist of short supplementary books which would make use of the skills and vocabulary children learn at the various levels of Patterns. Children would be encouraged to read these books just for fun. No lesson plans or activity suggestions would be included for teacher use.

In this library, there would be approximately 10 books for each of five levels--Preprimer, Primer, Book 1, Book 2, and Book 3. At each level a variety of literary genres--fiction, nonfiction, and poetry--would be represented.

At the Preprimer and Primer levels, all books in the Power Library would be written especially for this project. Books for the sighted at these levels are too visual, and vocabulary and skills need to be carefully controlled.

At the Books 1, 2, and 3 levels, most books could be selected from the many books available for sighted children. Permission would be obtained from the publishers to make minor changes where necessary. These changes would consist mainly of adding sentences and paragraphs where illustrations are omitted. One or two books at each level might be written especially for the blind reader.

At the present time few early primary level books are available in braille. Therefore, young braille readers are hampered in practicing their newly acquired reading skills and acquiring the habit of reading for fun. The Power Library would help meet these needs. Eleanor Pester, working closely with Eddy Jo Bradley and Hilda Caton, would be responsible for this project.

## Mathematics

### Introductory Mathematics Project

Work completed during FY 1980. In 1979 a needs meeting was held to identify materials most needed in the area of mathematics. The highest priority need was for entry level, primary grade math materials designed to introduce and teach concretely basic math operations and concepts to blind students. Work in this area was initiated during FY 1980. A tentative content scope and sequence chart of mathematics concepts was prepared focusing on the prekindergarten-kindergarten level to serve as a framework for initial work on the project. Related literature was reviewed and classroom activities were observed. The goal of these endeavors was the identification of core activities and concrete aids for introducing prenumber mathematics concepts to young blind students, with the intent of developing sequential activities. Some 100 pre-kindergarten activities and accompanying manipulative aids were prepared and used with young blind students.

Work planned for FY 1981. This phase of the project is a continuation of previous work at the prekindergarten level. The principal objective of this phase is the development and formative evaluation of an instructional package for presenting entry-level mathematics concepts to young blind students at the prekindergarten and kindergarten levels. This package includes:

1. A manual of task-oriented activities presented in sequential order
2. Accompanying manipulative objects and aids
3. A behavioral objective-type checklist for measuring student progress and/or for assessment
4. Instructions for use

The materials will be developed at the Florida School for the Deaf and the Blind and will receive formative evaluation by three teachers who will use the materials with young students. This project will provide background information and support for a proposed project, Fundamental Mathematics Concepts for Physically Handicapped Students, to be submitted to the National Science Foundation for consideration for funding. Results from this Introductory Mathematics Project, including formative evaluation data, will be incorporated in the proposal, which is an inclusive and comprehensive endeavor. The objective of the expanded project is summarized in the following National Science Foundation proposal abstract.

Access to careers in technological, scientific, and mathematics related vocations has been severely restricted for the legally blind population. Blind students are consistently low achievers in mathematics. They lack knowledge and understanding of fundamental concepts that provide the foundation for performance, mastery, and comprehension of basic mathematical operations appearing in upper elementary and junior high curricula. Consequently, the majority never acquires an adequate conceptual background for entry into advanced math and technical courses, including many vocational offerings. It is the intent of this project to develop manipulative materials and/or alternative instructional approaches for establishing a mathematics content base for ameliorating the condition.

Frank Franks is the project director, assisted by Sandra Albrecht in cooperation with the Florida School for the Deaf and the Blind. Bob Glass is the APH assistant.

#### Critique of Base 10 Materials in Mathematics

Work planned for FY 1981. Participants in the 1979 APH meeting on needs of blind students in mathematics established as the highest priority the development of entry level, primary grade materials which are designed to introduce and teach concretely basic math concepts and operations to blind students. High priority was given to the adaptation and evaluation of commercially available Base 10 materials (often referred to as exponential blocks or Number-Blox) which can be used to introduce a wide variety of mathematical concepts at the entry level. These materials were also recommended by experts assessing mathematical content for APH and have been repeatedly endorsed by the National Council of Teachers of Mathematics. The manipulative materials are designed to teach number, grouping, place value, area, perimeter, and the concepts and properties of addition, subtraction, multiplication, and division. They consist of units, tens, hundreds, and thousands blocks on a centimeter scale with accompanying student-use software.

The materials will be critiqued with blind students to determine student ability to manipulate and use the aids appropriately, and to collect suggestions for adaptation. Dr. Evelyn Neufeld, Associate Professor in School of Education

at San Jose State University, who developed the materials for Creative Publications, has served as a consultant for APH as a mathematics education expert. Bob Glass will conduct the project.

### The Abacus: A Relaxed Approach to Arithmetic

Work planned for FY 1981. Several years ago APH undertook a project in which self-instructional materials were developed for use of the Cranmer Abacus. Written and recorded materials were coordinated such that they could be used either together or independently. These materials were never finalized. Kerry Cundiff will be responsible for editing them and otherwise preparing them for production.

## Science

### Audio-Tutorial Reference Materials in Biology (Cell Division)

Work completed in 1980. The purpose of this project, which was funded by the National Science Foundation, was the development of cell division models for use in self-instructional reference materials. The development was a response to a need for audio-tutorial reference materials which blind and visually handicapped students can use without teacher assistance in the rapid-paced mainstream.

The materials consist of 6 mitosis and 13 meiosis models--each depicting a phase of cell division--and accompanying self-instructional tapes. The written materials were prepared and edited by project staff who developed scripts for independent use with each model. These scripts were reviewed by prominent science educators for content and for vocabulary/reading level. Evaluation consisted of critiques by teachers whose students used the materials and by biology students themselves. Evaluation focus was on the appropriateness of the program as a supplementary/reference aid to instruction.

The materials were used by 20 braille and large print students in residential and public school classes. All students participating were able to use the materials to identify critical events occurring in mitosis and meiosis. Their responses yielded a number of valuable suggestions; notably, that large print and braille glossaries be included with each set of materials and that specialized vocabulary be spelled out on each tape. Braille students particularly wanted to have the specialized terms spelled out with correct contractions and also to have them spelled letter by letter on the tapes. Students were pleased with the format and its consistent use, which includes: phase overview, introduction, model orientation, content, summary, and unit tests (with answers). They liked being able to verify answers immediately in the question/answer exercises. The repetition and questions and answers appeared to enable students to learn more easily.

Work planned for FY 1981. The first quarter of FY 1981 will be used for completing the final project report for submission to the National Science Foundation. Critiques and evaluations will be reviewed in an effort to set tentative guidelines for the development of subsequent audio-tutorial reference



materials in science for use in junior high and middle school programs.

#### Micro-Slide Cassette Program

Work completed during FY 1980. Eighty sets of micro-slides, designed for use with an inexpensive micro-slide viewer, were reviewed by three science teachers for the purpose of selecting 20 sets with representative views of plant and animal cross-sections and structures that would be common in basic science curricula. Visual clarity was a criterion for selection. These materials were accompanied by a written description and content of each script was edited and recorded by visually handicapped students. The resulting materials are identified as Level I of the Micro-Slide Cassette Program.

Visual legibility testing of the micro-slides was conducted with more than 50 low vision students from grades 5-12. Since near point acuities were not available, preliminary near vision screening of the students was required. This was done using the Lighthouse Near Acuity Test designed with Sloan letters for testing vision at 16 inches. It yields a Snellen fraction which can be converted to an approximate Jaeger type designation or to approximate printer point sizes. Although this screening device lacks the precision of that used by the medical profession, it afforded a common base for comparing and analyzing student performance. Performance was found to exceed the criterion that 85% of the legally blind students classified as print readers would score 70% or higher on the 32-item array of letters, symbols, and structures selected from the slide views.

In another phase of the evaluation, approximately 25 elementary and science teachers from public school programs evaluated the effectiveness of the materials as used by their visually handicapped students. The results of this evaluation were positive, with some teachers indicating that even totally blind students were able to profit from the information on the accompanying tapes.

Work planned for FY 1981. An additional 20 sets of micro-slides, Level II, will be identified, reviewed, and evaluated. This set will have a higher content level than the Level I set. Evaluation procedures will follow those used with the Level I materials; however, as the content level is higher, the subjects used for evaluative purposes will be from grades 7-12. Frank Franks is responsible for this project. He is assisted by Debbie Willis and Mark Craven.

#### Annotated Bibliography on Science Education and the Visually Handicapped

Work completed during FY 1980. Partial bibliographies on science education and the visually handicapped from such sources as the National Science Teachers Association, APH, the American Foundation for the Blind, the American Association of Instructors of the Blind, ERIC Document Service, Science for the Handicapped Association, University Microfilms, and Dissertation Abstracts International were reviewed for relevant titles published in the 20th century. Abstracts were currently available for roughly 25% of the entries and the remaining titles were examined and abstracted. The resulting annotated bibliography contains over 200 sources and is divided into three categories: Research Supported by Data, General Publication, and Sources Unavailable for Review. This information will be included in a much broader annotated bibli-

ography on science and the handicapped supported by ERIC Document Service. The original information is on file in the APH Research Library. Bob Glass was responsible for this work.

## Social Studies

### Continental Relief Map Cassette Program

Work completed during FY 1980. As a continuation of work previously completed for North America, South America, and Europe, tapes for Africa and Australia were developed, reviewed by content experts, subjected to teacher critiques, and evaluated by project staff as they were used by 30 students from grades 5-10.

The tapes were evaluated in day school programs to determine the appropriateness of the format and content for mainstreamed blind students. Acceptance by teachers and students was unanimous.

These materials are being developed to accompany APH's Simplified Continental Relief Maps. The tape program consists of three cassettes for each continent. The first includes an introduction to the continent and provides a guide for its systematic tactual exploration. The second focuses on specific features. The third includes socio-historic information and significant historic sites. Each tape is 20-30 minutes long.

Work planned during FY 1981. As with the other five continents, tapes will be developed and evaluated for Asia. The evaluative procedure will be similar to that described for Africa and Australia. The work on this project is directed by Frank Franks. He is assisted by Mark Craven, John Barth, and Bob Glass.

### Introduction to Map Study: The Globe

Work planned for FY 1981. The globe study project is one of a series. The development of fundamental map reading concepts by young blind students has been identified as an area of critical need. The young sighted student is introduced to map and globe study at the primary grade level. Because of the highly visual and abstract nature of globes, the operations involved, and the concepts taught, there is a need for carefully designed instructional material to introduce basic globe concepts to young blind students. Globes are used simultaneously with simplified continental relief maps to demonstrate the curvatures and locations of the various continents as they appear on the earth.

The project is scheduled for a 2-year period. During the 1st year a feasibility/exploratory study will be conducted to determine the content and entry level for introduction of globes to blind students. Tentatively the project will address objectives on two levels. Level I will focus on introduction of basic globe concepts to primary grade (kindergarten-grade 3) students. Level II will focus on the globe to map/map to globe relationships. Students begin to establish this relationship after they have acquired basic map concepts and basic globe concepts. The project will consider grade 3 as the entry level



for Level II. It is at grade 3 that students begin to recognize similarities between areas introduced on a map and the same areas introduced on a globe.

The project materials for Level I will include the APH 14-inch globe with the indented equator and student-use activities involving a minimum number of directional referents. These referents were selected from those previously tested for use by Franks in 1974 on maps. A total number of 10 entry level referents specifically relating to use of the globe have been incorporated. Materials for Level II will include landform models, simplified continental relief maps, and the globe.

Since the literature is devoid of information on teaching entry level map and globe concepts to young blind students--except for APH studies--most of the evaluation during the 1st year will be formative. Initially, evaluation activities for Level I will involve the use of directional activities on the globe by blind students at grades 6 and 7. Subsequently, the activities will be revised and used with younger students. Level II activities will focus on the map to globe/globe to map relationship and also will be used initially with blind students in grades 6 and 7. As with Level I, the activities will then be revised and used with younger students. Frank Franks will be the project director, assisted by Mary Nelle Council, Tennessee School for the Blind. Bob Glass will be the APH assistant.

## Tactile Graphics

### Graph Studies

Work completed during FY 1980. During April and May of 1980, 20 braille readers in grades 5-7 at three residential schools for the blind participated in a tactile graph study. The study involved a systematic examination of the students' accuracy and speed in executing the various finger movements required in point location tasks, an important aspect of graph interpretation. The following variables were manipulated: (a) direction of movement, (b) length of movement, (c) presence or absence of a grid, and (d) presence and absence of an interfering line. The data resulting from this study will be analyzed and subsequently used in the design of tactile graphics.

Work planned for FY 1981. The raised-line grids used in tactile graphs for the blind substantially increase the difficulty of tactually perceiving the data curves embedded in them. This is true even when there is a difference in elevation and texture between the grid and the data curves. In an attempt to alleviate this problem, a study will be conducted in which raised-line data curves are displayed against a background composed of incised grid lines. It is expected that the use of incised lines will decrease the tactual "noise" of the grid background, while at the same time retaining the advantages inherent in the inclusion of a grid. Performances on tasks involving raised grids and incised grids will be compared, using 24 braille readers in grades 4-6. John Barth is responsible for these studies.

### The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers

Work completed during FY 1980. A proposal to develop a systematic program



of graph instructional materials for blind students was submitted to BEH and formally approved in July 1980. Funding will begin in September 1980. The project, entitled "The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers," will take 2 1/2 years to complete.

Work planned for FY 1981. Several objectives will be pursued during the 1st year of the project. The first objective will involve the identification of the skills and concepts required in graph interpretation. The types of graphs and the instructional programs that are currently being used by sighted students will also be identified and examined. In addition to reviewing existing programs for the sighted, Dr. Charles Thompson, a curriculum specialist at the University of Louisville who is particularly knowledgeable in graphs and mathematics instruction, will assist the principle investigators in developing a list of the skills and concepts necessary for graph reading.

The second objective will involve the development of a test of these skills and concepts, and will include both written and graphic materials. This test is considered to be an integral evaluative aspect of the program.

The third objective will involve the development of specifications for the graph reading program and will be accomplished by the principle investigators in conjunction with a committee of consultants and an in-house APH committee. The consultants will be composed of math, science, and social studies teachers in the field of the blind from residential and public school programs.

In March 1981, Dr. Thompson, the committee of consultants, and the principle investigators will assemble in Louisville for a 2-day meeting. At that time, the list of skills and concepts, the tests developed for them, and the specifications for the graph reading program will be reviewed and revised. A pilot of the revised test will then be conducted in Spring 1981 by administering it to 20 braille reading students in grades 5-10. This phase of the project will not only provide information on the adequacy of the test but also information on additional concepts, skills, and materials that might be needed in the program. John Barth is the principle investigator for this project. He will be assisted by Ed Berla'.

#### Plate Embossing Apparatus

Work planned for FY 1981. Due to the top priority placed on the design and construction of the Tactile Graphics Kit and on the setup of a design and development facility at APH, very little of Gary Davis' time could be allocated to the development of this new plate embossing system for tactile graphic displays during FY 1980. It is expected, however, that its design and construction will be completed in FY 1981. If feasible, legibility testing of the point, linear, and areal symbols producible by this device will also be conducted during that period. John Barth and Gary Davis are responsible for this project.

#### Tactile Graphics Kit

Work completed during FY 1980. A field evaluation of the kit was conducted

in January and February 1980. Five of the evaluators were teachers of the visually impaired and five were volunteer transcribers of graphic materials. All of these individuals had previous experience in constructing tactile graphic displays. The purpose of this evaluation was (a) to determine whether any components needed to be modified, deleted, or added before going into production, and (b) to obtain critical feedback on Section I of the Guidebook, which describes the proper use of the kit's tools and materials. Each evaluator read and critiqued Section I of the Guidebook, constructed several representative tactile displays by means of the kit, and completed an evaluation questionnaire.

The general response to the kit and the Guidebook was quite enthusiastic. Revisions based on the information obtained from the field evaluation have been completed.

Legibility testing of the point, linear, and areal symbols contained in the kit was completed in Spring 1980. Sixty braille-reading students in grades 4-12 from five residential schools for the blind and two public school programs participated in the study. Only those symbols which were successfully discriminated by 95% of the students were deemed useful for inclusion in the kit.

Although revisions will continue to be made, the Guidebook is essentially finished. It contains information on (a) the effective use of the kit's tools, (b) the designing of legible tactile displays, and (c) introducing blind students to reading tangible displays. Sample tactile displays in braille and sketches depicting the proper use of the tools are also included in the Guidebook.

Gary Davis, an engineer/designer with APH, worked on feasible tools and manufacturing processes for producing the kit in quantity. Product quality and cost were major considerations in this regard. It is expected that the Tactile Graphics Kit will be made available to the public by January 1981. John Barth is responsible for this project. He is assisted by Gary Davis and Ed Berla'.

## Other Research

### Educational Measures

Work completed during FY 1980. Work underway during this period addressed priority areas identified by project consultants at a needs meeting held in March 1979.

A braille adaptation of the KeyMath Diagnostic Arithmetic Test was completed and its directions for administration modified accordingly. These were reviewed by an appropriate project consultant and by personnel from American Guidance Services, publisher of the test. Both the test and its directions were found consistent with the print editions and approved for publication. In an investigation of print sizes used in the print edition of the KeyMath test, it was found that all but eight items were in 18-point or larger type. Consequently, no large type version of the test will be required.

APH has worked closely with The Psychological Corporation, publisher of the Stanford Achievement Series, in the development of the 1982 series. Over 20,000 items from the item pool have been individually checked as to their

adaptability into braille. Where possible, the publisher will use only those items that can be presented in braille in the final forms of the new series. Consequently, the braille and print versions of the test should be quite similar. Only in subtests where it is necessary to omit items from the braille edition will it be necessary to have the norms recomputed to reflect just those items appearing in the braille edition. This will be the first published achievement series specifically designed with blind users in mind.

Work was initiated on preparation of the Stanford Diagnostic Reading Test, published by The Psychological Corporation, for braille and large type editions. This entailed editing the various tests within the series and then adapting the directions for administration accordingly. While the first level (red) cannot be adapted into braille, due to the highly pictorial content, the upper three levels (grades 3-13) adapt well.

Work planned for FY 1981. Adaptation of the Stanford Diagnostic Reading Test will be completed and reviewed by the test publisher, and the adaptation of the new Stanford Achievement Series will be initiated. The goal for the latter test is that the braille and large type editions be available for use at the same time that the print edition is released. Additionally, investigation of meeting other test needs identified by the project consultants will be continued. Bill Duckworth is responsible for this work.

### Educational Games

Work completed during FY 1980. Silly Sandwich and Sneaky Snake were successfully field tested with pairs of visually handicapped and normally sighted children 6 to 8 years of age, using taped instructions. The Game Kit was evaluated by seven teachers who used it with visually handicapped children 6 to 8 years of age, and by two experts on games for the visually handicapped.

Efforts were made to disseminate information about the development of games for the visually handicapped. A presentation on the development of games was made at the North American Simulation and Gaming Association Conference and this information was submitted for publication.

Work planned for FY 1981. The data collected on Silly Sandwich, Sneaky Snake, and the Game Kit will be analyzed and modifications made to the materials where necessary. Beyond this, there are no further plans to continue work on games as the Game Kit will enable users to adapt and create games for themselves. Also, many commercial game companies are now considering the handicapped population when they develop and market games. Plans will be made, however, to consider the need for games and recreation for the visually handicapped again in a few years when the results of these developments will be more apparent. Eleanor Pester has been the project director. She was assisted by Deborah Willis, Mark Craven, and Kerry Cundiff.

### Relationships between Visual Acuity, Reading Mode, and School Systems for Blind Students--A 1979 Replication

Work completed during FY 1980. The purposes of this study are to determine the reading medium(s) being used by legally blind students having varying degrees of vision and to learn where these students are being educated and at what grade levels.



Initially, APH's Data Processing Department ran a list of agencies that had registered students in January 1979 for quota purposes. Each of these agencies was then classified into one of six types of educational programs: residential, MR residential, MH residential, state department (local), commission, or rehabilitation. At the same time, each student's visual acuity was categorized into one of nine visual categories ranging from 20/200 to total blindness. APH's computers were then programmed to provide information similar to that provided for the 1976 quota registration and the 1979 registration data were processed accordingly.

Work planned for FY 1981. Data appearing on computer printouts will be tabulated, analyzed, and trends determined. The findings will be published in a report similar to those of the earlier studies in this series. These earlier studies reflect data from 1960, 1963, 1966, 1969, 1972, and 1976. Deborah Willis is responsible for this project.

#### Academic Achievement of Legally Blind Students

Work completed during FY 1980. The primary objective of this project is to determine if legally blind students in grades 2 through 6 are performing academically at grade level, as measured by the Stanford Achievement Test. The second objective is to determine specific concept areas in mathematics where deficiencies exist. In order to accomplish these objectives, many schools and school systems that purchased the Stanford Achievement Test in braille or large type between January 1977 and September 1979 were contacted regarding (a) availability of data from the administration of these tests and (b) their willingness to share these data. Simultaneously forms on which necessary information could be reported were drafted and tested.

Teachers, counselors, and others furnished raw scores and/or grade equivalents for approximately 370 students on each subtest of four levels of the Stanford Achievement Test. They also identified the questions incorrectly answered on the three math subtests of the same four levels by approximately 250 of the 370 students.

Work planned for FY 1981. These data will be reviewed, posted, and analyzed to determine if legally blind students are performing academically at grade level and to determine specific concept areas in mathematics where deficiencies exist. Deborah Willis is assisted by Mark Craven and Kerry Cundiff in this project.

#### Needs Assessment

Work planned for FY 1981. Appropriate consultants will be identified and meetings convened for the purposes of determining and assigning priority to research and materials needs in two areas: (a) low vision and (b) rehabilitation

#### Proposal Development

Work planned for FY 1981. If feasible, a proposal will be developed and submitted to the most appropriate funding agency for developing an interface(s) that would enable information stored on computer tapes resulting from APH's

computerized braille translation program to be rendered in a form that could be used by paperless braille reading devices. This could make the several thousand books that have been translated by this program available for reading by such means.

### Application of Listening Research

#### Recorded References for the Visually Impaired and Other Handicapped

Work completed during FY 1980. Production by APH of The World Book Encyclopedia, Recorded Edition, c 1980, continued to be coordinated through the Department of Educational Research. Additionally, Department staff was responsible for editing the content for recording and preparing copy for the written indexes. Both of these latter tasks were completed.

Work planned for FY 1981. Production of the encyclopedia will continue to be coordinated by the Department of Educational Research. Its production is on schedule and the encyclopedia will be available for fall 1980 distribution. Production costs are being partially underwritten by a grant awarded by BEH.

The recorded encyclopedia will come as a package which includes an Indexing Cassette Player, specifically designed by APH for use with the encyclopedia, and 19 volumes. Binding of the volumes resembles that of the school edition of The World Book Encyclopedia. The full set can be stored on approximately 6 feet of shelf space. Each volume contains special cassettes on which the content of the encyclopedia is recorded and indexes in braille and large type. A total of 219 specially designed cassettes, each containing up to 6 hours of recording, is included. The encyclopedia's design is based on years of research and is known to be practical and useful to anyone who can read well enough to use the indexes to locate specific items in alphabetical listings.

June Morris has been responsible for coordinating the production of this product. Sharon Bensinger and Mark Craven edited the content for recording; Kerry Cundiff prepared copy for the written indexes.

Agencies Participating in Research during FY 1980

Throughout the country and beyond, numerous individuals, schools, and agencies have made possible the work of APH's Department of Educational Research. Without the continuing cooperation of such, it would not be possible to maintain a research and development program such as the one described in this report; for to do so it is essential that input be sought from and provided by the staffs of such agencies, and that evaluative information be obtained from staffs and students/clients. Those schools and agencies participating in projects during the past year include:

Allegheny Intermediate Unit; Pittsburgh, Pennsylvania  
Arkansas School for the Blind; Little Rock  
Blair High School, Pasadena, California  
Boston City Schools; Boston, Massachusetts  
California School for the Blind; Berkeley  
Cardinal Hill School and Hospital; Lexington, Kentucky  
Casis Elementary School; Austin, Texas  
Coastal Center, MHVI Unit; Ladson, South Carolina  
Colorado IMC for Visually Handicapped; Denver  
Dallas Services for the Visually Impaired; Dallas, Texas  
Delaware Public Schools; Delaware  
Detroit Public Schools; Detroit, Michigan  
    The Mann Elementary School  
    The Marquette Elementary School  
E. B. White Elementary School; New Orleans Louisiana  
Educational Services Center; Austin, Texas  
Einstein School; Hanover Park, Illinois  
Elkhart County Rehabilitation; Elkhart, Indiana  
Fayette County Schools; Lexington, Kentucky  
Florida School for the Deaf and the Blind; St. Augustine  
Foster School; Braintree, Massachusetts  
Georgia Academy for the Blind; Macon  
The Governor Morehead School; Raleigh, North Carolina  
Hamilton County Schools; Cincinnati, Ohio  
Harahan Parrish Schools; Harahan, Louisiana  
    Harahan Elementary School  
    J. V. Fairchild Junior High School  
Harris-Hillman Public School; Nashville, Tennessee  
Hill Top High School; Chula Vista, California  
Indiana School for the Blind; Indianapolis  
Kentucky School for the Blind; Louisville  
Louisiana School for the Visually Impaired; Baton Rouge  
Mansfield City Schools; Mansfield, Ohio  
McAteer High School; San Francisco, California  
Michigan School for the Blind; Lansing  
Mississippi School for the Blind; Jackson  
Missouri School for the Blind; St. Louis  
Nebraska School for the Visually Handicapped; Nebraska City  
New Jersey Commission for the Blind; Newark  
New Mexico School for the Visually Handicapped; Alamogordo  
New York Institute for the Education of the Blind; Bronx



New York State School for the Blind; Batavia  
North Carolina State Department of Education; Raleigh  
Oak Hill School; Hartford, Connecticut  
Ohio State School for the Blind; Columbus  
Orange Grove School; Chattanooga, Tennessee  
Parker High School; Janesville, Wisconsin  
Pasadena High School, Pasadena, California  
Rochester Public Schools; Rochester, Minnesota  
Sacramento Public Schools; Sacramento, California  
    McClatchey High School  
    Mira Loma High School  
Salt Creek School; Elmhurst, Illinois  
San Diego City Schools; San Diego, California  
    Mission Bay High School  
    Ross Elementary School  
SEEM Cooperative; Winchester, Massachusetts  
Sir Frederick Fraser School; Halifax, Nova Scotia, Canada  
Special Education Department; St. Peter, Minnesota  
St. Rita's; Louisville, Kentucky  
Tennessee School for the Blind; Nashville  
Texas School for the Blind; Austin  
Utah School for the Blind; Ogden  
Virginia Department for the Visually Handicapped; Richmond  
Virginia School for the Deaf and the Blind; Staunton  
Vista Unified School District; Vista, California  
Washington Park School; Cincinnati, Ohio  
West Suburban Association; Lombard, Illinois  
    Butterfield School; Lombard  
    Dearborn Heights School; Oak Lawn  
    Hinsdale Junior High School; Hinsdale  
Wisconsin School for the Visually Handicapped; Janesville

Consultants during FY 1980

Beginning Braille Reading Series

Mrs. Ruth Craig, Instructor (Retired), Brigham Young University, Springville, Utah

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago, Chicago, Illinois

Dr. Philip H. Hatlen, Professor, Department of Special Education, San Francisco, State University, San Francisco, California

Miss Freda Henderson, Teacher (Retired), Tennessee School for the Blind, Monkton, Maryland

Dr. Earl F. Rankin, Professor, Department of Educational Psychology, University of Kentucky, Lexington, Kentucky

Dr. Evelyn Rex, Professor, Department of Special Education, Illinois State University, Normal, Illinois

Miss Marilyn Sorenson, Consultant, Vision and Physically Handicapped, Minnesota State Department of Education, St. Paul, Minnesota

Mrs. Bonnie Trowbridge, Teacher of the Visually Handicapped, Pekin Public Schools, Pekin, Illinois

Dr. Mila B. Truan, Teacher, George Peabody College for Teachers and Tennessee School for the Blind, Nashville, Tennessee

Teacher Evaluators:

Miss Helen Berry, Primary Teacher, Missouri School for the Blind, St. Louis, Missouri

Miss Sharon Kitain, Primary Teacher, Missouri School for the Blind, St. Louis, Missouri

Miss Patti Lenske, Special Teacher, Hinsdale Junior High School, Hinsdale, Illinois

Ms. Linda Morris, Resource Teacher, Einstein School, Hanover Park, Illinois

Miss Rosemary Paskas, Special Teacher, Missouri School for the Blind, St. Louis, Missouri

Mrs. Alice Queenon, Primary Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Miss Joanne Racchini, Resource Teacher, Dearborn Heights School, Oak Lawn, Illinois

Miss Kathy Viskant, Itinerant Teacher, Butterfield School, Lombard, Illinois

Mrs. Mary Helen Welsh, Primary Teacher, Kentucky School for the Blind, Louisville, Kentucky

Miss Deanna Yeager, Primary Teacher, Kentucky School for the Blind, Louisville, Kentucky

#### Educational Games

Dr. Patricia A. Gallagher, Professor of Special Education and Coordinator of the Areas of Emotionally Disturbed, Special Education Department, University of Kansas Medical Center, Kansas City, Kansas

Mrs. Vivian Pohlmann, Blind Mother of Two Preschoolers, Hastings, Nebraska

#### Teacher Evaluators:

Ms. Ingrid Bettis, Primary Teacher, Tennessee School for the Blind, Nashville, Tennessee

Ms. Lynn Laird, Primary Teacher, California School for the Blind, Berkeley, California

Mr. Mickey Madden, Teacher of the Visually Handicapped, Salt Creek School, Elmhurst, Illinois

Mrs. Linda Moreash, Primary Teacher, Sir Frederick Fraser School, Halifax, Nova Scotia, Canada

Ms. Cathy Reiber, Teacher of the Visually Handicapped, Special Education Department, St. Peter, Minnesota

Ms. Bonnie Rudel, Primary Teacher, Texas School for the Blind, Austin, Texas

Mrs. Mary Jane Sims, Speech Teacher, Kentucky School for the Blind, Louisville, Kentucky

#### Educational Measures

Mrs. Sarah Ashman, Psychologist, Indiana School for the Blind, Indianapolis, Indiana

Dr. Earl F. Rankin, Professor, Department of Educational Psychology, University of Kentucky, Lexington, Kentucky

#### Light Box and Accompanying Materials

Mrs. Kay Ferrell, Doctoral Student, University of Pittsburgh, Pittsburgh, Pennsylvania



Ms. Audrey Smith, Low Vision Mobility Specialist, William Feinbloom Vision Rehabilitation Center, Philadelphia, Pennsylvania

#### Mathematics

Mrs. Sandra Albrecht, Early Childhood Specialist, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mr. Anthony Evancic, Mathematics Teacher, Philadelphia Public Schools, Philadelphia, Pennsylvania

Mr. John D. Meharg, Teacher of Deaf-Blind, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mrs. LaRhea Sanford, Curriculum Coordinator, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mr. Tuck Tinsley III, Mathematics Teacher, Florida School for the Deaf and the Blind, St. Augustine, Florida

#### Prevocational Materials Development

Mr. Jim Fuller, Toy Safety Engineer, U.S. Testing Laboratory, Hoboken, New Jersey

Mr. Rodger Hoffman, Deaf-Blind and Multihandicapped Program Coordinator, University Hospital School, Iowa City, Iowa

Mr. Frank Pepe, Vice-President, U.S. Testing Laboratory, Hoboken, New Jersey

Mrs. Renee Sachs, Prevocational Specialist, Maryland School for the Blind, Baltimore, Maryland

#### Revision of the Utilization of Low Vision Kit

Dr. Earl F. Rankin, Professor, Department of Educational Psychology, University of Kentucky, Lexington, Kentucky

#### Teacher Evaluators:

Mrs. Joy Brauer, Teacher, Wisconsin School for the Visually Handicapped, Janesville, Wisconsin

Mr. Jim Deremeik, Teacher, Arkansas School for the Blind, Little Rock, Arkansas

Mrs. Polly Grimes, Teacher, The Governor Morehead School, Raleigh, North Carolina

Ms. Pat Kraft, Teacher, New Mexico School for the Visually Handicapped, Alamogordo, New Mexico

- Miss Helen Marshall, Teacher, Mansfield City Schools, Mansfield, Ohio
- Mrs. Karen Matheny, Teacher, Virginia School for the Deaf and the Blind, Staunton, Virginia
- Mr. Don Pickering, Director of Education, Nebraska School for the Visually Handicapped, Nebraska City, Nebraska
- Ms. Leslie Ryan, Teacher, New Jersey Commission for the Blind, Newark, New Jersey
- Ms. Barbara Shalit, Teacher, New Jersey Commission for the Blind, Newark, New Jersey
- Ms. Alice Stabinsky, Teacher of Visually Handicapped, Orleans Parrish Schools, New Orleans, Louisiana
- Mrs. Sarabeth Watson, Teacher of Visually Handicapped, Rochester Public Schools, Rochester, Minnesota

### Science

- Dr. Paul C. Beisenherz, Associate Professor, College of Education, University of New Orleans, New Orleans, Louisiana
- Dr. Dean Brown, Professor, Science Department, Colorado State University, Ft. Collins, Colorado
- Ms. Florie Fedder, Vision Consultant, Colorado IMC for Visually Handicapped, Colorado Department of Education, Denver, Colorado
- Dr. Elva R. Gough, Vision Specialist, DeKalb County Public Schools, Smithfield, Tennessee
- Mrs. Rebecca Hunton, Science Teacher, Indiana School for the Blind, Indianapolis, Indiana
- Ms. Carla McMillan, Elementary Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Dr. Kenneth Ricker, Associate Professor, Science Education, University of Georgia, Athens, Georgia
- Mrs. LaRhea Sanford, Curriculum Coordinator, Florida School for the Deaf and the Blind, St. Augustine, Florida
- Dr. Ronald Simpson, Associate Professor, North Carolina State University, Raleigh, North Carolina
- Dr. Irwin Slesnick, Professor of Biology, West Washington University, Bellingham, Washington
- Mrs. Dorothy Tombaugh, Biology Teacher, Lyndhurst Public Schools, Lyndhurst, Ohio

Teacher Evaluators:

Ms. Anna Lee Braunstein, Science Teacher, Mira Loma High School, Sacramento, California

Mrs. Karen Gautheir, Elementary Teacher, Harahan Elementary School, Harahan, Louisiana

Ms. Suzi Hazelkorn, Vision Teacher, McAteer High School, San Francisco, California

Ms. Janet Jackson, Itinerant Teacher, SEEM Cooperative, Winchester, Massachusetts

Mr. Richard Klipstein, Science Teacher, Parker High School, Janesville, Wisconsin

Mrs. Judith Laakmann, Vision Teacher, Blair High School, Pasadena, California

Ms. Hope Magier, Vision Teacher, Boston City Schools, Boston, Massachusetts

Mrs. Margaret Ritchie, Vision Supervisor, Pasadena Unified School District, Pasadena, California

Mrs. Alice Stabinsky, Elementary Teacher, E.B. White Elementary School, New Orleans, Louisiana

Mr. Pascual Talamantes, Science Teacher, Hill Top High School, Chula Vista, California

Ms. Norma Ueleke, Science Teacher, Tennessee School for the Blind, Nashville, Tennessee

Mr. William Wallace, Vision Teacher, McClatchey Senior High School, Sacramento, California

Ms. Prudence Walsh, Itinerant Teacher, San Diego City Schools, San Diego, California

Ms. Kathy Williams, Science Teacher, Georgia Academy for the Blind, Macon, Georgia

Ms. Marsha Williams, Itinerant Teacher, Vista Unified School District, Vista, California

Mr. Tim Yerian, Itinerant Teacher, Hamilton County Public Schools, Cincinnati, Ohio

Social Studies

Mrs. Mary Nelle Council, Social Studies Teacher, Tennessee School for the Blind, Nashville, Tennessee

Dr. Jack Miller, Professor, George Peabody College for Teachers, Nashville, Tennessee



Dr. Jewell Phelps, Professor of Geography, George Peabody College for Teachers,  
Nashville, Tennessee

Tactile Graphics Kit

Ms. Bernadette Alber, Itinerant Teacher, Chicago Public Schools, Chicago, Illinois

Ms. Nancy Amick, Coordinator of Raised Line Drawing Unit, Recording for the Blind,  
Princeton, New Jersey

Mr. Don Bethune, Principal, Senior Division, W. Ross Macdonald School, Brantford,  
Ontario, Canada

Ms. Betty Epstein, Past President, NBA, Miami Public Schools, Miami, Florida

Ms. Carol Frey, Librarian, Kentucky School for the Blind, Louisville, Kentucky

Ms. Helen Grapka, Teacher, New York State School for the Blind, Batavia, New York

Ms. Becky Hunton, Science Teacher, Indiana School for the Blind, Indianapolis,  
Indiana

Ms. Ruth Komopik, Volunteer Transcriber, Omaha Public Schools' Visually Impaired  
Program, Omaha, Nebraska

Mr. Bob Ley, Mobility Instructor, Greater Pittsburgh Guild for the Blind,  
Bridgeville, Pennsylvania

Ms. Virginia Montgomery, Volunteer Transcriber, Industrial Home for the Blind  
Braille Library, Hempstead, New York

Dr. Roseann Reid, Chairperson of Education Department, Greater Pittsburgh Guild  
for the Blind, Bridgeville, Pennsylvania

Vision Stimulation and Training Materials for Developmentally Young Visually  
Impaired Students (0-36 months)

Mrs. Pat Carpenter, Supervisor, Programs for the Visually Handicapped, DeKalb  
County Schools, Scottdale, Georgia

Mrs. Amie Dennison, Retired Teacher and Low Vision Specialist, Nashville,  
Tennessee

Dr. Marvin Efron, OT, PhD, Optometrist, Columbia, South Carolina

Mrs. Kay Ferrell, Doctoral Student, University of Pittsburgh, Pittsburgh,  
Pennsylvania

Mrs. Carmella Gates, Assistant Professor, University of Northern Colorado,  
Greeley, Colorado

Dr. Julie Jones, Project Training Officer, Research and Training in Mental Retardation, Texas Tech University, Lubbock, Texas

Miss M. Beth Langley, Instructor in Special Education, George Peabody College of Vanderbilt University, Nashville, Tennessee

Teacher Evaluators:

Ms. Ellen Bernstein, Infant Specialist, Virginia Department for the Visually Handicapped, Richmond District Office, Richmond, Virginia

Mrs. Sue Birkenshaw, Teacher, Utah State School for the Blind, Ogden, Utah

Mrs. Margo Calvert, Infant Specialist, Elkhart County Rehabilitation, Elkhart, Indiana

Mrs. Linda Dike, Teacher, Cardinal Hill School and Hospital, Lexington, Kentucky

Mrs. Georgia Duprey, Supervisor, MHVI Unit, Coastal Center, Ladson, South Carolina

Mrs. Karen Heidenthal, Teacher, Allegheny Intermediate Unit, Pittsburgh, Pennsylvania

Miss Denise Kumberg, Multihandicapped Coordinator, New York Institute for the Blind, Bronx, New York

Miss Debbie Lannom, Physical Therapist, Orange Grove School, Chatanooga, Tennessee

Mrs. Betsy Nelson, Teacher, Fayette County Schools, Lexington, Kentucky

Mrs. Eileen Reed, Teacher, Educational Services Center, Austin, Texas

Mrs. Jannie Shapiro, Mobility and Low Vision Specialist, Oak Hill School, Hartford, Connecticut

Miss Kathy Spence, Deaf-Blind Coordinator, State Department of Education, Raleigh, North Carolina

Miss Barbara Surbutts, Teacher, Foster School, Braintree, Massachusetts

Mr. Tom Wigton, Teacher, New York State School for the Blind, Batavia, New York

Mrs. Jeanna Wilson, Infant Teacher, Dallas Services for the Visually Impaired, Dallas, Texas

Miss Pam Wyatt, Teacher, Harris-Hillman Public School, Nashville, Tennessee

Mrs. Lynne Young, Supervisor of Preschool Programs, State of Delaware, Wilmington, Delaware

Research and Developmental Personnel for FY 1980

|                          |                                |
|--------------------------|--------------------------------|
| Anderson, Diane          | Administrative Assistant       |
| Barth, John, PhD         | Research Scientist             |
| Bensinger, Sharon, BS    | Research Assistant             |
| Berla', Edward, PhD      | Research Scientist (part time) |
| Caton, Hilda, EdD        | Research Scientist (part time) |
| Craven, Mark, BA         | Research Assistant             |
| Cundiff, Kerry, BA       | Editorial/Research Assistant   |
| Davis, Gary              | Design and Development Section |
| Dennison, Amie, MA       | Librarian/Research Associate   |
| Duckworth, Bill, MS      | Librarian/Research Scientist   |
| Franks, Frank, EdD       | Research Scientist             |
| Frere, Suzette, BA       | Research Assistant             |
| Glass, Robert, MEd       | Research Assistant             |
| Jacobi, Patricia         | Library Clerk/Clerk Typist     |
| Moore, Sheri Bortner, MS | Research Scientist             |
| Morris, June, MA         | Director                       |
| Pester, Eleanor, MS      | Research Associate             |
| Poppe, Tom               | Design and Development Section |
| Segovia, Mercia, PhD     | Research Assistant (special)   |
| Williams, Luella         | Library Clerk/Clerk Typist     |
| Willis, Deborah, BA      | Research Associate             |



Publications during FY 1980

- Caton, H. A primary reading program for beginning braille readers. Journal of Visual Impairment & Blindness, 1979, 73, 309-313.
- Caton, H., & Rankin, E. Variability in age and experience among blind students using basal reading materials. Journal of Visual Impairment & Blindness, 1980, 74, 147-149.
- Duckworth, B. J. Research in the adaptation of existing academic tests for the visually handicapped. International Journal of Rehabilitation Research, 1980, 3, 268-269.
- Evancic, A., Tinsley, T., III, & Glass, B. Elementary problem solving: A self-instructional program using the APH Student Speech Plus Calculator. Louisville, Ky.: American Printing House for the Blind, 1979.
- Glass, R. D. An annotated bibliography on science education and the visually handicapped. Louisville, Ky.: American Printing House for the Blind, 1979.
- Tinsley, T., III, Evancic, A., & Glass, B. Elementary computation: A self-instructional program using the APH Student Speech Plus Calculator. Louisville, Ky.: American Printing House for the Blind, 1979.
- Willis, D. H. Relationships between visual acuity, reading mode, and school systems for blind students. Exceptional Children, 1979, 46, 186-191.









DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES  
FISCAL 1981

**American  
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The activities described in this report reflect a productive year for the Department of Educational Research at the American Printing House for the Blind (APH). As in recent years, efforts have been concentrated on materials development projects. These have covered a broad spectrum, including early childhood and/or multihandicapped, low vision, braille reading, tactile graphics, mathematics, science, and educational measures.

Funding of the research program remains a concern. Although much of the year's work was supported with research monies designated as such and included in APH's appropriation from Congress, additional funds were and are necessary to maintain current levels of productivity. During the year, two projects were funded through federal grants from the Office of Special Education. These were "The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers," submitted under the Bureau of Education for the Handicapped's Research and Demonstration Program; and "A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children," submitted under the Bureau's Handicapped Media Services and Captioned Films Program. Another project, "Audio-Tutorial Reference Materials in Biology," was funded through a grant from the National Science Foundation. To help meet the need for future funds, a new grant proposal was developed during the year, submitted to the National Science Foundation, and subsequently funded for a mathematics program entitled "Fundamental Mathematics Concepts for Physically Handicapped Students."

A major effort was made during the year to work closely with production personnel to expedite manufacture of products previously approved for production. Procedures for doing so were formalized and implemented, and appear to be effective. Additionally, personnel in the Department's Design and Development Section are now addressing the need for prototypical materials for new educational aids that are production engineered, while simultaneously developing the patterns needed for their production. All production prototypes now are being developed in collaboration with production personnel and take into consideration manufacturing process in order to provide for the most cost-effective production possible.

Pamphlet File  
Research List  
APH

Cooperation from persons working in the field has remained excellent. Administrators have willingly granted access to students, and teachers and other professionals have joined efforts with the research staff in the development and evaluation of materials that will effectively meet some of the most pressing needs of the field. Well over a hundred consultants and teacher evaluators have participated in projects during the year. Such interaction with the field is considered essential in keeping APH's efforts on target.

In response to requests from the field, members of the research staff have conducted 39 workshops during the year related to use of new materials. Generally, staff is available for such provided the sponsoring agency can pay travel expenses.

Following is a summary of research and development activities for the year and a preview of future work.

## Early Childhood and Multihandicapped

### Prevocational Skills Development Material

Work completed during FY 1981. This set of materials was approved for production in October, 1979. The materials formally entered APH's production pipeline during July, 1980. In preparation for release of the materials, all resources and references in the accompanying written component were updated. Bill Duckworth and Sheri Moore coordinated the revisions.

### A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Work completed during FY 1981. A 1979 APH needs assessment, dealing with the infant and preschool level child, prioritized materials to assist parents of visually impaired children functioning from birth to 2 years, through critical development stages. To meet these needs, the research staff conceptualized a package of tangible, written, and recorded materials for use in stimulating such developmental "milestones" as reaching, grasping, bringing hands to the midline, and object permanence. The audio portion of the package would illustrate appropriate parent/child interactions. A teacher guidebook would contain activities, objectives, and guidelines in using the materials package.

A proposal requesting federal grant monies was submitted to the Bureau of Education for the Handicapped under the Handicapped Media Services and Captioned Films Program. In September, 1980, APH was notified that the grant proposal, "A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children," was fully funded for the requested 2-year period. Project staff began work on the new project in November, 1980. An extensive literature review, resulting in examination of more than 100 journal articles, books, and other publications, concentrated on four areas. The areas included: information on normal development of children birth to 2 years; critical areas of skill development in the visually impaired child from birth to 2 years; guidelines and resources for parents; and materials for teachers in designing and implementing home-based educational programs. Along with providing a solid base for project development, this literature review will be included in a resource manual for teachers and parents.

Some 150 questionnaires were distributed to teachers of young visually impaired children during the Fall of 1980. These results were compiled and studied carefully to identify skill areas where visually impaired children begin to break down in their development as compared with their sighted peers and the kinds of materials needed for remediation. The consulting committee, which met in March, 1981, considered both the questionnaire results and the literature review in determining materials to be developed. Following the committee meeting, three basic components were suggested for development: one, an electronic, vinyl-covered mat which, when a child placed upon it makes appropriate movements, would reward him with various sensory stimuli (e.g., sound, vibration, etc.). The second component would be a slide-tape or videotape presentation to be taken into the home by professionals and nonprofessionals in the field. The information in this presentation would reinforce



that in the third component, a Resource Guide, giving extensive information to teachers and parents on the physical and emotional development of the young visually impaired child. Other tangible items suggested and under consideration include a headband, which plays a musical tune when the head is righted, and wristband to which interesting tactual, visual, or auditory objects could be attached.

Specifications were formed and drawings made for each tangible item with the assistance of an industrial/toy designer. Subsequently, the design and project staff began to locate commercial sources in preparation for making the prototype models. Plans for the audio components and resource materials were also discussed and refined.

Work planned for FY 1982. Efforts are continuing in locating manufacturers of the numerous components needed for each of the three tangible items. Initial prototypes will be constructed during August-November, 1981. Simultaneously, work will proceed on the resource materials and on preparation for an audio prototype. An audio-visual specialist will be consulted for this phase of the project. Formative evaluations of all the project materials will be conducted December 1981-January 1982. The formative data will be compiled during February, followed by a meeting of the consulting committee in March. The evaluation data and committee suggestions will assist in designing revisions of the tangible, audio, and resource materials components. During April and May, the materials will be revised and 12 sets produced for formal field evaluation. Field evaluation sites and arrangements will also be established at this time. The field evaluation itself will be conducted during June-July, 1982, and will include parents as well as educators. Sheri Moore is assisted by Sharon Bensinger, Kerry Cundiff, and Suzette Frere on this project.

#### Low Vision

##### Vision Stimulation and Training Materials (VS&TM) for Developmentally Young Visually Impaired Students (0-36 months)

Work completed during FY 1981. Work has proceeded steadily on the VS&TM project since formative evaluation data were compiled and analyzed in September 1980. The evaluation yielded some helpful information and a direction for project continuation. Clearly, evaluating teachers were enthusiastic about the VS&TM, but felt that additional materials were needed at the 0-6 month and 24-36 month developmental levels. Based on the evaluating teachers' recommendations, several materials were modified or deleted, and some new materials were designed and constructed.

Within the black light/fluorescent items component of the project, 12 new items were added at the lowest and highest levels of visual responsiveness, as recommended. None of the 12 items are available commercially, but were developed by project staff. Activity suggestions were written for each new item and expanded for each of the existing items. A skill chart, indexing 25 visual functions, was added to the software, as well as a section containing basic guidelines for using a black light.

In the APH-designed materials component, five new items were constructed to elicit visual interest, attention, and tracking. These materials, not available commercially, were suggested by teachers in the formative evaluation phase.

The component of the project comprising commercial materials of high visual interest has been modified. Because of problems with suppliers of commercial materials, and a Departmental attempt to deemphasize such items, it was decided to take a photograph of each high visual interest item, note its manufacturer, and include this information in the Teacher's Resource Guidebook. The high visual interest section will include guidelines that will assist teachers in purchasing effective commercial vision stimulation items. Considerable time was spent in selecting the 65 items to be included in the high visual interest section.

Several other facets of the VS&TM project have received staff time and attention. Many manufacturers of lighting equipment have been contacted in an effort to find a more portable black light lamp, as requested by itinerant and home-based teachers. The Visual Developmental Sequence Chart, a comprehensive table of visual development from birth through 36 months, was updated, revised, and changed to an index card format. Twenty-five leading ophthalmologists and vision research centers throughout the U.S. were contacted concerning black light and its safety. The consensus is that our black light environment is not harmful or dangerous. Consultants for the VS&TM project met in Spring, 1981, to review project modification and progress.

Several formative evaluations were conducted on the new and revised items in the VS&TM kit. Evaluating teachers completed written questionnaires and gave suggestions for refinements of the materials needed prior to formal field evaluation. After several modifications were made, based on the formative review, the materials were prepared for field evaluation, taking place from May through August, 1981. An extensive teacher evaluation form was developed to elicit information concerning the developmental level for which the materials are most appropriate; vision stimulation materials currently used; the relative interest level of the materials for the students; ratings for each material; improvements to be incorporated into the revision of the materials; suggestions for additional items and related written material; durability; construction; safety of the materials; and so on.

Work planned for FY 1982. The materials will be evaluated by 15 teachers. Subjects utilized in the testing will be infant, preschool, and multiply handicapped visually impaired, with an overall function level of birth to 36 months. Sites will include residential schools for the blind, private agencies, and public school programs, and will be selected on the basis of having competent teachers motivated to provide their developmentally young students with vision stimulation experiences. Data collected from field evaluators will be compiled and analyzed by project staff and materials will be revised as results indicate. The project timeline calls for presentation and production approval of the VS&TM at the October 1981 meeting. Following approval, the materials will undergo preparation for production, and the resource materials and activities will be edited and reviewed by an expert. When a set of production prototypes is completed, the materials will be reviewed by U.S. Testing for safety

standards approval. A final report will be written summarizing all the research and development efforts on this project. The project leader, Sheri Moore, is assisted by Sharon Bensinger, Kerry Cundiff, and Suzette Frere.

### Light Box and Accompanying Materials

Work completed during FY 1981. In July and August, 1980, a Fiberglas prototype of a rheostat-controlled light box was designed and constructed at APH. Twelve items were made for use with the light box based upon suggestions received from project consultants and 25 teachers surveyed through a questionnaire.

The light box materials were formatively tested at four sites in the fall of 1980. Data from the evaluation were compiled, analyzed, and the materials were revised in January 1981. At that time, an ABS plastic model of the light box was thermoformed; a new mechanism for reclining the box at various angles was designed, and the box was equipped with a new means of holding materials on its surface. The box measures 25.5 X 14.5 X 6 inches and weighs approximately 13 pounds. Ten items now accompany the light box:

1. Colored acetate backgrounds
2. Tracing backgrounds
3. Form discrimination backgrounds
4. Colored transparent and opaque shapes
5. Colored plexiglas face puzzle
6. Colored plexiglas ball puzzles
7. Colored transparent threading shapes
8. Plexiglas rattle
9. Plexiglas spinner
10. Colored transparent tumblers

Activities have been written for each item and included in a guidebook which provides guidelines for use of the light box and lists of common and commercial materials which may be used with it.

The light box materials are nearing the end of their field evaluation. Five teachers of visually impaired and multihandicapped visually impaired children functioning from birth to 4 years have used the materials for a 7 to 9 week period.

Work planned for FY 1982. After completion of the field evaluation, data will be analyzed and the materials revised accordingly. A production model of all materials will be submitted to U.S. Testing for extensive safety testing. Suzette Frere is responsible for this project. Tom Poppe designed the light box.



### Low Vision Needs Meetings

Work completed during FY 1981. Two low vision needs meetings were held by APH on April 23-24, and May 14-15, 1981. The purposes of the meeting were to identify research and materials needs that might be addressed by APH. Seven different consultants on low vision participated with research staff in each meeting. Subsequently, lists of research and materials needs were compiled and sent to the 14 consultants and the 10 members of APH's Educational Research and Educational Aids Committees for the purpose of prioritizing the identified needs. Ed Berla' and Debbie Willis were responsible for organizing the meetings and prioritizing research and materials needs. The following research needs were given highest priority:

1. Determine if reading rate can be improved by training low vision readers decoding skills such as practice discriminating commonly confused letters, letter combinations, words, etc.
2. Identify reading characteristics of low vision persons.
3. Study the perceptual processes underlying all low vision functioning: visual memory and whole-part/part-whole concepts.
4. Determine whether low vision persons can be taught to read smaller print sizes efficiently by gradually and systematically reducing print size.

The following needs for materials were given high priority:

1. An updated, well organized description of skills needed to function in a variety of occupations and the aids that could be used by low vision persons, and adaptations a low vision person might need to make to perform the job.
2. Low vision aids familiarity packet with training materials and/or a manual explaining how to use low vision aids as well as variables that affect visual functioning.
3. Adaptation or development of a reading curriculum that focuses on introductory reading with young low vision children which emphasizes visual efficiency factors and component skills such as identifying first letter of words, anticipation skills, guessing, reducing memory load through chunking, etc.
4. A videotape presentation designed for low vision persons of factors that affect visual functioning and how to maximize efficiency.

Work planned for FY 1982. Initial work will be undertaken to address research needs. John Barth and Mercia Segovia will work in this area.

## Reading

### Beginning Braille Reading Series

Work completed during FY 1981. Progress on the development of Patterns: The Primary Braille Reading Program has continued. The first and second runs of the Readiness and Preprimer materials and the first run of the Primer materials were made available and sold out during the 1980-81 school year. Revisions of the First Reader materials were completed and have been prepared for production. Field testing of the Second and Third Readers' experimental materials continued. During FY 1981, 19 workshops to familiarize persons working in the field with this new braille reading program were conducted in the following locations: Arkansas, California (3), Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Maryland, Massachusetts, Mississippi, Nebraska, Ohio, South Carolina, Texas, Virginia, and Washington.

Work planned for FY 1982. Readiness and Preprimer materials will be run for the third time and Primer level materials will be run for the second time. First Reader level materials will be available in October. Field testing of the Second Reader materials will be completed and the materials will be revised and prepared for production by the fall of 1982. Field testing of the Third Reader materials will continue with production of this level still scheduled for the fall of 1983. At the present time, no workshops are scheduled, but additional workshops can be arranged if requested.

Hilda Caton and Eleanor Pester have been responsible for this project. They were assisted by Sharon Bensinger and Kerry Cundiff. Eddy Jo Bradley has served as the directing editor. Nancy Pitt, an APH stereograph operator, has worked with project staff on preparing the special braille plates required. Mercia Segovia assisted in the construction of the criterion-referenced tests.

### Pattern's Power Library

Work completed during FY 1981. Plans for the development of a Power Library to accompany Patterns: The Primary Braille Reading Series were finalized. There will be five levels--Preprimer, Primer, First Reader, Second Reader, and Third Reader. Each level will make use of the skills and vocabulary presented in the corresponding level of Patterns. Drafting of the 15 books on the Preprimer level was completed.

Work planned for FY 1982. The Preprimer books will be reviewed by APH staff and prepared for outside review by three consultants who are familiar with Patterns. Following this review, the Preprimer materials will be revised and prepared for production. Subsequent levels will be developed in succession following the same procedure. Appropriate commercially available books will be included at the First through Third Reader levels. It is expected that during FY 1982, in addition to the work on the Preprimer level already described, work on the Primer level will be completed, books on the First Reader level will be ready for review, and selection of books for the Second and the Third Reader levels will have begun. Eleanor Pester is responsible for this project, assisted by Eddy Jo Bradley, the directing editor of Patterns.

## Mathematics

### Introductory Mathematics Project

Work completed during FY 1981. Entry level mathematics content is critical since it underlies the performance, mastery, and comprehension of basic mathematics operations at the elementary grade level. This project has focused on prenumber entry level concepts at the (pre)kindergarten level. The focus or emphasis has produced a number of activities for demonstrating and teaching basic prenumber mathematics concepts. These activities have been paired with tactile aids (manipulatives), have been edited, and have been sequenced tentatively. In December an advisory committee met to review the content and the activities and to suggest a program format for presenting the activities to young blind students. Tactile aids also were reviewed by the project director and staff to determine those which would accompany the activities in preliminary field trials of the materials.

Three mock-up sets of materials and prekindergarten activities were prepared and sent out for preliminary review by teachers of blind students. The teachers reviewed the activities for their appropriateness for young blind students, the aids for their suitability for use with the activities, and the sequence of the activities. The teachers were positive in their responses and again emphasized the need for an introductory mathematics program for young blind students.

Work planned for FY 1982. APH has been awarded a grant for the development of introductory mathematics materials from the National Science Foundation. The name of the grant is "Fundamental Mathematics Concepts for Physically Handicapped Students." The activities and materials described will provide baseline information for this project and will be incorporated into the program materials. The project is briefly described in the proposal's abstract which follows:

Access to careers in technological, scientific, and mathematics-related vocations has been severely restricted for the legally blind population. Blind students are consistently low achievers in mathematics. They lack knowledge and understanding of fundamental concepts that provide the foundation for performance, mastery, and comprehension of basic mathematical operations appearing in upper elementary and junior high curricula. Consequently, the majority never acquires an adequate conceptual background for entry into advanced math and technical courses, including many vocational offerings. It is the intent of this project to develop manipulative materials and/or alternative instructional approaches for establishing a mathematics content base for ameliorating the condition.

The proposal was prepared by Frank Franks with assistance from Bob Glass. The two are responsible for work on this project.



### Base 10 Materials in Mathematics: Legibility Study

Work completed during FY 1981. Base 10 blocks are manipulative materials designed to teach number, grouping, place value, area, perimeter, and the concepts and properties of addition, subtraction, multiplication, and division. They consist of units, tens, hundreds, and thousand blocks on a centimeter scale with accompanying student-use software. These materials were recommended by experts assessing mathematical needs for materials and have been repeatedly endorsed by the National Council of Teachers of Mathematics. It is the purpose of this project to determine the earliest age and grade level at which the Base 10 Materials can be appropriately manipulated by young blind students, to develop guidelines for possible materials adaptation, and to identify the critical concepts in entry level instruction for which the materials have application. Such information will provide a basis for determining whether the Base 10 Materials should be made available as a separate educational aid and/or included with the "Fundamental Mathematics Concepts for Physically Handicapped Students" program materials.

Planning for a study to determine the legibility and manipulability of the Base 10 Materials was initiated and the materials were piloted with 23 visually handicapped pupils in grades K-2.

Work planned for FY 1982. Legibility testing will be undertaken and decisions made as to adaptations needed for program materials. Bob Glass is responsible for this project.

### The Abacus: A Relaxed Approach to Arithmetic

Work completed during FY 1981. Review of these materials, drafted several years ago but never finalized, indicated that a major effort (rewrite) would be required if they are to be honed into publishable condition. Because of this and the questionable need for such, no further work on them is planned at this time. Kerry Cundiff and June Morris were responsible for the review.

## Science

### Audio-Tutorial Reference Materials in Biology (Cell Division)

Work completed during FY 1981. This project was completed in December, 1980, and a final report prepared and submitted to the National Science Foundation. A summary of the project follows.

The principal objective of this project was the development and evaluation of self-instructional materials in cell division for use by visually handicapped students. The primary products of this project were 6 mitosis and 14 meiosis models (color-coded tactile schematics in relief)--each depicting a phase of cell division--with accompanying self-instructional cassette tapes, braille and large print glossaries, and a print copy of the tape scripts with labeled drawings for use by teachers and sighted readers. A subordinate objective was the preparation of guidelines for the subsequent development of self-instructional materials for prebiology students and for other physically handicapped students who can utilize such materials in conjunction with other modalities.

The models and tapes were reviewed by science experts to ensure content accuracy, structures displayed on the models were empirically tested for tactile legibility, and the reference package was evaluated by participating teachers and by legally blind student project assistants who used the materials. The evaluation interviews with teachers and students revealed their enthusiasm for the materials and their appropriateness for visually handicapped students. Critiques by content experts confirmed that the materials have a universal reference value for all biology students in the mainstream.

A guidelines format was adapted from the student/teacher interview form to provide categories of checklist items for potential developers of self-instructional materials for upper elementary and prebiology students. Frank Franks, assisted by Bob Glass, was responsible for this project.

### Micro-slide Cassette Tape Project

Work completed during FY 1981. Students and teachers who used the first set of micro-slides and accompanying tapes were unanimous in their endorsement of the materials and requested additional slides and tapes. Twenty additional units (Level II) were selected and the units content edited for taping. Evaluation forms and procedures were completed for visual legibility testing of the slides. The slides present eight views of various cross-sections and structures in life science. The micro-slide views generally are clear and uncluttered and utilize print letters, arrows, and brackets in identifying important structures. Individual letter size approaches 18 point.

Visual legibility of the micro-slides was tested using 30 low vision students from grades 5-12. Several students who were designated as having only light perception were able to identify symbols and structures on a number of the slides. Performance was found to exceed the criterion that 85% of the legally blind students classified as print readers would score 70% or higher on the 20-item array of letters, symbols, and structures selected from the slide views.

Two complete sets of the micro-slides, cassettes, and viewers were evaluated in classrooms with visually handicapped students. Each micro-slide title contains slide photographs and taped descriptions which students and teachers evaluated to determine if sufficient information was obtainable from each slide and/or tape to recommend its inclusion in the Level II set. All sets were recommended for Level II. A number of braille students who were unable to use the slides reported the tapes contained valuable information. Frank Franks was the project leader. He was assisted by Bob Glass.

## Social Studies

### Continental Relief Map Cassette Program

Work completed during FY 1981. The cassette tape program to accompany the simplified continental relief map of Asia was evaluated with 30 legally blind students from grades 5-10. The tape program consists of three cassettes for each continent. The first includes an introduction to the continent and provides a guide for its systematic tactual exploration. The second focuses on specific features. The third contains socio-historic information and describes significant historic sites. Each tape is 20-30 minutes long.

The master tapes for North America were completed and are in production. The final scripts for South America, Europe, Asia, Africa, and Australia have been completed. Frank Franks and Bob Glass have worked on this project.

### Introduction to Map Study: The Globe

Work completed during FY 1981. A review was made of scope and sequence charts of geographical skills and elementary social studies texts to identify entry level map reading skills not available or readily accessible to young blind students (K-2) in the social studies curriculum. The review focused on skills and information considered critical for acquisition of the globe-to-map concept, including scale and distance, symbology, shape and size, and orientation (location and direction).

Information gained at the convention of the National Council of Social Studies indicated that there will be less focus on geography in the 1980's in social studies textbooks, although map study and "social roles" will receive varying amounts of space and emphasis. Because of the lack of agreement on specific goals by the National Council of Social Studies, the project materials will be viewed as a "tool" and will focus on those concepts critical to blind students which are not presented in social studies texts and will avoid curriculum emphasis in social studies. Needs of orientation and mobility teachers will receive consideration.

Geographical features on the globe which are essential for teaching basic globe concepts using a minimum number of locational and directional referents at the primary grade level were identified. The educational aids which will be used in this set of materials include APH's Geo-Physical Globe and Simplified Continental Relief Map of North America. The globe will be mounted in a



stand which will afford student inspection and rotation without loss of locational landmarks (North and South Poles). Additional materials include sequenced activities following the concept breakdown described.

Teachers and sites for both development and evaluation of the project materials were identified and an initial draft of the program activities was developed.

Work planned for FY 1982. The globe materials will be evaluated by teachers who use them with blind students in public and residential school classes. Subsequently, the materials will be revised as needed. This work will complete a series of projects in the Introduction to Map Study Program that has been developed for young blind students. Bob Glass is assisting Frank Franks with the project.

### Tactile Graphics

#### Graph Study (Raised vs. Incised Grids)

Work completed during FY 1981. A previous study conducted by Barth (1979) revealed that the raised-line grids used in tactile graphs for the blind substantially increase the difficulty of tactually perceiving the data curves embedded in them. This is true even when there is a difference in elevation and texture between the grid and the data curves. In an attempt to alleviate this problem, a study was conducted in which raised-line data curves were displayed against a background composed of incised grid lines. In this study, 24 braille readers in grades 4-7 were asked to perform four of the primary tasks required in tactile graph interpretation: (a) tracking a data curve, (b) locating the highest and lowest excursions of the data curve, (c) locating point symbols, and (d) identifying the coordinate values of a data point. Each of these tasks was performed under three background conditions: (a) raised grid, (b) incised grid, and (c) no grid or control.

The results of this experiment indicated that, in comparison to a raised grid, an incised grid significantly enhances performance in graph reading tasks. In the raised grid condition, the time needed to track a data curve was 96% longer than in the incised grid condition. The time needed to locate the highest and lowest excursions of a data curve was 128% longer. Locating point symbols required 157% more time. There was no difference in the time needed to identify the coordinate values of a data point. Moreover, in tracking a data curve, 88% of the subjects lost finger contact with the line one or more times in the raised grid condition. Only 29% of the subjects exhibited this problem in the incised grid condition. A greater number of errors were also caused by the raised grid in terms of identifying the highest and/or lowest excursions of a data curve. Forty-six percent of the students committed such errors when a raised grid was present as compared to 21% when the grid was incised. Finally, the accuracy in identifying the x and y coordinate values of a data point was equally good under both conditions. It is therefore recommended that incised grids be incorporated into the design of tactile graphs. By employing raised lines for the data curves and incised lines for the grid background, the problem of disruptive tactual stimulation or "noise" is attenuated without sacrificing the benefits incurred by the inclusion of a grid background. John Barth was responsible for this study.

The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers.

Work completed during FY 1981. During the 1st year of the project, a list of 62 skills and concepts fundamental to the graph reading process was derived by analyzing the implicit and explicit tasks required by graphs which appear in textbooks (mathematics, social studies, science, and business), graph instructional programs for the sighted, and standardized academic tests. The types of graphs most commonly used and the grade level at which each type is typically encountered were also identified. Based on the list of skills and concepts, a criterion-referenced, multiple-choice test was developed for assessing a student's attainment of these skills and concepts. The test consisted of 62 items, the large majority of which involve the examination and interpretation of tactile graphics of varying degrees of complexity. All verbal text was converted into grade 2 braille. On March 7, 1981, the tactile version of the test was presented for review and revision to a committee of consultants (composed of five teachers of the blind from residential and public school programs). As a result of that meeting the test was revised. This version of the test was then piloted in April and May, 1981, using 20 braille readers in grades 5-10. The purposes of the pilot were to reveal: (a) difficulties in students' handling of the test format (including the use of answer sheets), (b) students' level of mastery of the skills and concepts deemed important in graph interpretation, (c) additional skills and concepts needed in the program, (d) problems with the wording of questions, and (e) deficiencies in the designs of the tactile displays. Based on the information collected in the pilot evaluation, further revisions of the test were made.

Work planned for FY 1982. During the 2nd year of this project, the primary objective will be the development and implementation of the graph instructional program itself. The primary responsibility for this task will be assumed by John Barth, the project director, and Edward Berla', the principle project assistant. Development of specifications of the program has been initiated, and was one topic of discussion at the consultants' meeting in March. Several sources of information will be taken into account as the content and design of the program are developed: (a) skills, concepts, and graph types identified during the 1st year of the project, (b) existing graph programs for normally sighted persons, (c) data collected during the pilot of the graph test, (d) research studies concerned with the teaching of graph reading skills, and (e) recommendations of the consultants and an American Printing House in-house committee.

As it is presently conceived, the instructional program will consist of raised line graphic materials in both paper and plastic media and verbal text in recorded form (cassette tapes). The consensus of the committee of consultants was that the provision of recorded text would not only eliminate the considerable burden imposed on the student by lengthy passages of braille text, but would also allow the maintenance of higher levels of student motivation. Recorded text would also reduce the physical bulk of the program and production costs. Verbal material occurring in the context of any of the tactile graphics themselves will be presented in the form of grade 2 braille. All graphic displays will be designed for maximum legibility based on the available research on tactile displays.

In order to facilitate use of the program by teachers generally and not just those trained in the braille code, a print version of the entire program (text and graphics) will be constructed. Moreover, this teacher's guide will contain an overview of the program, its objectives, typical conceptual and graph reading problems exhibited by blind students, and suggested activities for developing graph reading skills.

In addition, accessory materials will be developed to allow the blind student to construct his own graphs. This type of participatory activity is considered important to the learning process. These materials will be simple and few in number. Activities utilizing these materials will be presented in the teacher's guide. Activities relevant to the understanding of pictographs, bar graphs, and line graphs will be emphasized.

Input from the consultants will be obtained at two different stages in the development process. First, ideas will be sought as sections of the program are initially drafted; and second, input will be sought after a complete version of the program is ready. This will be accomplished by convening a consultants meeting in Louisville, Kentucky during Spring, 1982. Based on the information received at that time, the program will be revised and readied for field testing in Fall, 1982. This version of the program will also be reviewed by an APH in-house committee.

The final activity planned for the 2nd year of the project will involve the construction of an evaluation questionnaire for use in the field testing of the instructional program. The questionnaire will focus on the content and design of both the instructional program and the test of graph skills and concepts. Suggestions for improvements will also be sought.

In summary, the final product will include an instructional program in tactile graph interpretation and a criterion-referenced test to evaluate the student's mastery of the material covered in that program. The following items represent those that are under serious consideration at this time for inclusion in the instructional program:

1. Graphic displays embossed in both paper and plastic (Braillon) media
2. Instructional text in recorded form (cassette tape)
3. Braille booklets containing stories which incorporate the reading of tactile graphs
4. Graphical games for one or two students
5. Materials for construction of tactile graphs by braille students
6. Teacher's guide (print)

John Barth is responsible for this project. He is assisted by Ed Berla'.



## Plate Embossing System

Work completed during FY 1981. The Plate Embossing Apparatus for Raised Lines (PEARL) is an improved system for the production of tactile graphic displays in a paper medium. A detailed set of specifications for PEARL has been developed and several mechanical designs for meeting those specifications have been considered. It has become apparent that the single most important key to the successful construction of PEARL lies in the controlled feed mechanism. This mechanism must also have the capability of producing continuous linear symbols.

Two approaches to this problem have been evaluated. The prototypes constructed were, however, rejected because of problems with reliable plate transport and with the negotiation of tight turns in a line. A third prototype does not have these problems and seems capable of satisfying all of the established criteria for implementing the system. Various types of interrupted and continuous linear symbols have been successfully produced by this prototype. Consequently, detailed drawings of the components of this system were undertaken. From these design drawings, an engineering model of the system will be constructed. The purpose of the model is to confirm the efficacy of the design philosophy and to pinpoint specific problem areas before construction of the working system is begun.

Work planned for FY 1982. Construction of the machine proper will commence as soon as the engineering model is completed and determined to be a feasible design approach. It is expected that a working system will be constructed by Spring, 1982, barring unforeseen setbacks. Prior to that point, decisions will be made as to the sets of point, linear, and areal symbols that are to be produced by the new device. The 1971 Nolan and Morris symbols will be given priority consideration, but it is expected that symbols not tested in that study will also be included. For example, since the new system will have the capability of producing incised symbols, consideration will be given to the inclusion of incised lines (for the background grid in a graph and perhaps the guidelines used in labelling) and incised areal patterns. If feasible, legibility testing of all the symbols will be conducted in Spring, 1982. The writing of an operating manual for the new system is planned for Summer, 1982. John Barth and Gary Davis are responsible for this project.

## Other Research

### Educational Measures

Work completed during FY 1981. Work underway during this period addressed priority areas identified by project consultants at a needs meeting held in March 1979.

The braille adaptation of the KeyMath Diagnostic Arithmetic Test was produced and field tested for format. The test will be packaged as a kit, which includes the three-volume braille test, the publisher's Manual for Interpretation, the APH Supplemental Directions for Administering, and 25 Diagnostic Student Records. The three-volume test will also be sold separately to replace the braille test as it becomes worn with use. The directions for administering

the braille edition of the test were reviewed and approved by the test publisher, American Guidance Service. The Stanford Diagnostic Reading Test was edited for braille and large type and the directions for administration were modified accordingly. The revised Manuals for Administering and Interpreting were reviewed and approved by personnel from Psychological Corporation, publisher of the test. The braille edition includes the upper three levels covering grades 3-13. It was found that the first level (red, for grade 1, grade 2, and low-achievers in grade 3) could not be adapted for braille. In large type, all four levels, for grades 1-13, were adapted. These braille and large type editions will be packaged as expendable tests with the answers to be indicated directly on the test pages.

Work planned for FY 1982. The Stanford Achievement Series (1982) will be received in September, 1981, and adaptation will begin immediately. The goal is to publish at least one form of the braille and large type editions at the same time the print edition is released in 1982. Bill Duckworth is responsible for this project as well as the work done during FY 1981.

Work will begin on a Diagnostic Test of Braille Reading Skills during this year. First specifications will be developed and an experimental edition of the test produced. The categories developed by Eric Hemp for Patterns will be used as a basis for the test. Since these categories were developed as units for teaching, they will be useful for a diagnostic approach with such a test. Bill Duckworth and Hilda Caton will be responsible for this project. They will be assisted by Sharon Bensinger.

### Academic Achievement of Legally Blind Students

Work completed during FY 1981. Data were accepted and recorded throughout the summer of 1980. During the fall of 1980, both the empirical and descriptive data received were reviewed and checked.

All items incorrectly answered on the three math subtests of the Stanford Achievement Series (Mathematics Concepts, Mathematics Computation, and Mathematics Applications) were recorded accordingly to form (A or B), reading medium (large type, regular print, or braille), and battery administered (primary II, primary III, intermediate I, or intermediate II). The percentage correct for each item was calculated and then the item difficulty value (percentage of pupils answering each item correctly based on national standardizations) was subtracted in order to identify those items on which legally blind students performed poorly. These data were calculated for 224 students.

Items on which the blind students performed poorly were identified. This information will be used in identifying concept deficits and targeting program materials in the introductory mathematics program.

Because of the extreme heterogeneity of the sample, age deviations (age at time of test-normal age for that grade) and grade deviations (grade equivalent-actual grade level) of the students on each of the 11 subtests were calculated. These calculations will supply information on whether the students are performing academically at grade level and whether they are equivalent in age to their normally sighted peers in regular schools at those grade levels. These data were calculated for 369 students.

Work planned for FY 1982. The age and grade deviations calculated will be checked. Appropriate analyses of these will be made, conclusions drawn, and a final report written. Debbie Willis is responsible for this analysis.

Relationships between Visual Acuity, Reading Mode, and School Systems for Blind Students--A 1979 Replication

Work completed during FY 1981. The purposes of this study were to determine the reading media being used by legally blind students having varying degrees of vision, and to find out where these students were being educated and at what grade level.

Various data regarding the visual categories, reading media, reading levels, grades, and educational programs were generated by the Data Processing Department of APH using the quota registration figures of 1979. These data were then tabled, checked, and analyzed so that changes over the past 3 years could be identified and trends examined.

A draft of the report on the above relationships was written and edited. A final draft has been prepared and is awaiting corrections, changes, and clarifications so that the manuscript can be submitted for publication.

A total of 33,061 legally blind students was registered with the American Printing House for the Blind in January 1979. This was an additional enrollment of 4,066 students over the number registered in 1976. Of this total, 30,563 students (92.4% of the students registered in 1979) comprised the present study.

In the state school programs, enrollment of the students included in the study increased by 4,579 (24%) students since 1976. Enrollment of the students included in the study in the residential schools dropped from 5,538 in 1976 to 5,150 students registered in 1979. This is a decrease of 7%. The number of students enrolled in commission programs who were included in the study rose from 958 to 1,032, an increase of 7.7%. In the multihandicapped residential schools, the number of students increased from 89 to 92, a gain of 3.4% while in the mentally retarded residential schools, the number decreased 36.4% from 379 to 241.

Sixteen percent of the students used braille in 1979 as compared to 21% in 1976. The percentage of large print readers decreased from 33% in 1976 to 28% in 1979. The proportion of readers of regular print remained at 7%. The percentage of students reading print material decreased from 52% in 1976 to 48% in 1979; however, the use of auditory media steadily continued to increase in all visual categories. Its total use rose from 24% in 1976 to 32% in 1979.

The proportion of students registered as ungraded is continually growing. The ungraded group includes those listed as nursery, nongraded, learning disabled, multihandicapped, mentally retarded, deaf-blind, cerebral palsied, physically handicapped, postgraduate, slow learners, and vocational school students. The percentage of students registered in this category increased from 40% in 1976 to 49% in 1979. Debbie Willis conducted this study.



### Rehabilitation Needs Meeting

Work planned for FY 1982. An initial meeting will be held in October, 1981, the purposes of which will be to identify and prioritize materials that are commonly needed by rehabilitation programs serving persons who are visually handicapped. Once such needs are identified, APH will attempt to address them. Initial participants will be identified by APH staff with the help of members of its administrative committees. June Morris is responsible for this meeting.

### Support Services

#### Design and Development Section

The Design and Development Section of the Department of Educational Research has established a system for the translation of conceptual ideas into practical manufactured products. Working closely with the Manufacturing Division of the Production Department, ideas are "sifted through" and prototypes developed. These prototypes are then subjected to evaluation. After meeting appropriate criteria, having their design approved, and being approved for production, product design and manufacturing processes are documented and turned over to the Production Department.

Gary Davis and Tom Poppe, craftsmen and designers, have joined efforts in the Design and Development Section to work through problems of design and methods of construction. Mr. Davis is responsible for developing research and production prototypes, for determining manufacturing process, and for working with the Production Department toward implementing product manufacture. Mr. Poppe is also responsible for developing prototypes, and making production molds, patterns, and models. Most recently, Mr. Davis has been designing and building a new piece of equipment to be used by APH in its braille plate-making operation for the production of high quality tactile graphics. Simultaneously, Mr. Poppe has been researching various plastic molding processes that might be used by APH to improve the quality of various existing and future products. In all cases, the materials themselves and the processes for producing them are being geared together in such a way that more efficient use can be made of APH's existing facilities and manpower.

#### Educational Research Library

While the Department's Library is maintained for staff use, students and others working in the field have found the collection of value as a source of a continuum of activities taking place over a period of time. The primary purchases made over the years have been journals of the field and publications relevant to particular research projects. Additionally, the collection includes pamphlets, dissertations, abstracts, reports, etc. that deal with the blind. While much of the collection was considered timely when published, many of the holdings could now be considered archival in nature; especially those items published on a one-time basis. Consequently, the collection proves to be of great value in its being irreplaceable. Bill Duckworth has served as the librarian. His assistant was Pat Jacobi.

Agencies Participating in Research during FY 1981

Throughout the country, numerous individuals, schools, and agencies have made possible the work of APH's Department of Educational Research. Without the continuing cooperation of such, it would not be possible to maintain a research and development program such as the one described in this report. Those schools and agencies participating in projects during the past year include:

Alice Carlson Elementary School; Ft. Worth, Texas  
Austin Independent School District; Austin, Texas  
Cherry Knoll School; Traverse, Michigan  
Cincinnati Public Schools; Cincinnati, Ohio  
Cline School District; Spring, Texas  
Clovernook Home and School for the Blind; Cincinnati, Ohio  
Colorado School for the Deaf and Blind; Colorado Springs  
Dallas Services for the Visually Impaired; Dallas, Texas  
DuPage-West Cook Regional Special Education Association; Lombard, Illinois  
Laidlow School; Western Springs, Illinois  
West Leyden High School; Northlake, Illinois  
Education Service Center Region 15; San Angelo, Texas  
Education Service Center Region 20; San Antonio, Texas  
Einstein School; Hanover Park, Illinois  
Elkhart County Rehabilitation; Elkhart, Indiana  
Florida School for the Deaf and Blind; St. Augustine  
Foster School; Braintree, Massachusetts  
The Governor Morehead School; Raleigh, North Carolina  
Hamilton County Schools; Cincinnati, Ohio  
Harahan Parrish Schools; Harahan, Louisiana  
Harris-Hillman Public School; Nashville, Tennessee  
Houston Independent School District; Houston, Texas  
Illinois School for the Visually Impaired; Jacksonville  
Indiana School for the Blind; Indianapolis  
Jefferson County Public Schools; Louisville, Kentucky  
Kentucky School for the Blind; Louisville  
Louisiana School for the Visually Impaired; Baton Rouge  
Maine Department of Human Services, Division of Eye Care; Augusta  
Maury School; Fredricksburg, Virginia  
Meyer Children's Rehabilitation Institute; Omaha, Nebraska  
Missouri School for the Blind; St. Louis  
New York Institute for the Education of the Blind; Bronx  
Nina Harris Exceptional Student Education; Pinellas Park, Florida  
North-West Illinois Association for Hearing, Visually & Physically Handi-  
capped; DeKalb  
Oak Hill School; Hartford, Connecticut  
Ohio State School for the Blind; Columbus  
Orange Grove School; Chattanooga, Tennessee  
Pasadena High School; Pasadena, California  
South Carolina School for the Deaf and Blind; Spartanburg  
Sullivan School; Denver, Colorado  
Tennessee School for the Blind; Nashville  
Utah School for the Blind; Ogden

Variety Club Blind Babies Foundation; San Francisco, California  
Virginia Commission for the Blind; Richmond  
Virginia Department for the Visually Handicapped; Richmond  
Vista Unified School District; Vista, California  
Western Carolina Center, Child-Family Intervention Services; Morganton  
West Virginia School for the Deaf and Blind; Romney



Consultants during FY 1981

Beginning Braille Reading Series

Mrs. Ruth Craig, Instructor (Retired), Brigham Young University, Springville, Utah

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago, Chicago, Illinois

Dr. Philip H. Hatlen, Professor, Department of Special Education, San Francisco State University, San Francisco, California

Miss Freda Henderson, Teacher (Retired), Tennessee School for the Blind, Monkton, Maryland

Dr. Earl F. Rankin, Professor, Department of Educational Psychology, University of Kentucky, Lexington, Kentucky

Dr. Evelyn Rex, Professor, Department of Special Education, Illinois State University, Normal, Illinois

Miss Marilyn Sorensen, Consultant, Vision and Physically Handicapped, Minnesota State Department of Education, St. Paul, Minnesota

Mrs. Bonnie Trowbridge, Teacher of the Visually Handicapped, Pekin Public Schools, Pekin, Illinois

Dr. Mila B. Truan, Teacher, George Peabody College for Teachers and Tennessee School for the Blind, Nashville, Tennessee

Teacher Evaluators:

Miss Helen Berry, Primary Teacher, Missouri School for the Blind, St. Louis, Missouri

Ms. Terry Deniston, Resource Teacher, Laidlow School, Western Springs, Illinois

Mrs. Dorothy Ferry, Primary Teacher, Illinois School for the Visually Impaired, Jacksonville, Illinois

Ms. Linda Morris, Resource Teacher, Einstein School, Hanover Park, Illinois

Mr. Tim O'Shaughnessy, Regional Special Education Teacher, West Leyden High School, Northlake, Illinois

Mrs. Alice Queenon, Primary Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Mrs. Sharon Thaler, Primary Teacher, Missouri School for the Blind, St. Louis, Missouri

Mrs. Mary Helen Welsh, Primary Teacher, Kentucky School for the Blind, Louisville, Kentucky

Miss Deanna Yaeger, Primary Teacher, Kentucky School for the Blind, Louisville, Kentucky

#### Educational Measures

Ms. Luella McDowell, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Dr. Joanne M. Lenke, Assistant Director, Educational Measurement Division, Psychological Corporation, New York

Dr. Earl F. Rankin, Professor, Department of Educational Psychology, University of Kentucky, Lexington, Kentucky

#### Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Mrs. Margaret Calvert, Infant Specialist, Elkhart County Rehabilitation, Elkhart, Indiana

Mrs. Pat Carpenter, Supervisor, Programs for the Visually Handicapped, Dekalb County Schools, Scottdale, Georgia

Mrs. Jan Cooper, Parent, Duncanville, Texas

Mr. Jay Doniger, Toy Designer, Buti-Roberts Advertising, Chicago, Illinois

Dr. Marvin Efron, O.T. PhD, Optometrist, Columbia, South Carolina.

Dr. Verna Hart, Professor, University of Pittsburgh, Pittsburgh, Pennsylvania

Mrs. Donna Heiner, Vice-President, International Institute for Visually Impaired 0-7, Inc., East Lansing, Michigan

Mrs. Wilma Hull, Doctoral Candidate, Boston College, Chestnut Hill, Massachusetts

Mrs. Julia Joehl, Parent, Hummelstown, Pennsylvania

Dr. Julie Jones, Project Training Officer, Research and Training in Mental Retardation, Texas Tech University, Lubbock, Texas

Mrs. Irna Marshall, Infant-Parent Trainer, Washington Commission for the Blind, Seattle, Washington

Light Box and Accompanying Materials

Mrs. Kay Ferrell, Senior Teaching Fellow, Department of Special Education,  
University of Pittsburgh, Pittsburgh, Pennsylvania

Mrs. Carmella Gates, Assistant Professor, University of Northern Colorado,  
Greeley, Colorado

Teacher Evaluators:

Mr. Mark Bane, Teacher, Dallas Services for Visually Impaired Children,  
Dallas, Texas

Mrs. Ellen Bernstein, Infant Specialist, Virginia Department for the Visually  
Handicapped, Richmond, Virginia

Mrs. Rebecca Brown, Teacher, Nina Harris Exceptional Student Education,  
Pinellas Park, Florida

Ms. Chris Curtis, Supervisor of Deaf-Blind Department, Colorado School for  
the Deaf and Blind, Colorado Springs, Colorado

Ms. Susan DeCaluwe, Supervisor of Multihandicapped Program, Meyer Children's  
Rehabilitation Institute, Omaha, Nebraska

Ms. Jay Greeley, Vision Resource Teacher, Sullivan School, Denver, Colorado

Ms. Diana Laird, Teacher, Nina Harris Exceptional Student Education, Pinellas  
Park, Florida

Ms. Judy McGruder, Teacher, Kentucky School for the Blind, Louisville,  
Kentucky

Ms. Dejean Miller, Infant Teacher, Education Service Center, Region XV, San  
Angelo, Texas

Ms. Elizabeth Morgan, Teacher, Colorado School for the Deaf and Blind, Colorado  
Springs, Colorado

Ms. Judy Murray, Supervisor of Deaf-Blind Department, Kentucky School for the  
Blind, Louisville, Kentucky

Ms. Linda Westover, Teacher, Colorado School for the Deaf and Blind, Colorado  
Springs, Colorado

Mrs. Jeanna Wilson, Teacher, Dallas Services for Visually Impaired Children,  
Dallas, Texas



### Low Vision Needs Meeting

- Mrs. Nan C. Dempsey, Supervisor, New Jersey Commission for the Blind and Visually Impaired, Camden, New Jersey
- Dr. Marvin Efron, Optometrist, University of South Carolina, West Columbia, South Carolina
- Mrs. Kay A. Ferrell, Senior Teaching Fellow, Department of Special Education, University of Pittsburgh, Pittsburgh, Pennsylvania
- Dr. George V. Gore, III, Professor, Michigan State University, East Lansing, Michigan
- Mrs. Ruth Holmes, Low Vision Coordinator and Educator, Illinois School for the Visually Impaired, Jacksonville, Illinois
- Dr. Richard M. Jackson, Associate Professor, Boston College, Chestnut Hill, Massachusetts
- Dr. Randall T. Jose, Optometrist, University of Houston, College of Optometry, Houston, Texas
- Dr. Gaylen Kapperman, Associate Professor, Department of Learning and Development, Northern Illinois University, DeKalb, Illinois
- Mrs. Jan Moseley, Low Incidence Implementation Specialist, Jefferson County Schools, Division of Special Education, Louisville, Kentucky
- Dr. Roseann B. Reid, Chairman of Education, Greater Pittsburgh Guild for the Blind, Bridgeville, Pennsylvania
- Mrs. LaRhea D. Sanford, Curriculum Coordinator, (formerly with the Florida School for the Deaf and Blind), St. Augustine, Florida
- Mrs. Phyllis Miron Schwartz, Teacher of Visually Impaired, BOCES III, Huntington (Dix Hills), New York
- Mrs. Rose Skolnick, Teacher Visually Impaired, Somerset, New Jersey
- Mrs. Betty Wommack, Coordinator of Support and Related Services, Kentucky School for the Blind, Louisville, Kentucky

### Mathematics

- Mrs. Sandra Albrecht, Early Childhood Specialist, (formerly with the Florida School for the Deaf and Blind), St. Augustine, Florida
- Ms. Jinger Brooks, Coordinator of ACCESS Program for Handicapped, Miami-Dade Community College, Miami, Florida

Mr. Anthony Evancic, Mathematics Teacher, Philadelphia Public Schools, Philadelphia, Pennsylvania

Mr. John D. Meharg, Teacher of Deaf-Blind, Clovernook School, Cincinnati, Ohio

Ms. Diana Peeples, Elementary Teacher, Florida School for the Deaf and Blind, St. Augustine, Florida

Mr. Tuck Tinsley III, Principal and Mathematics Specialist, Florida School for the Deaf and Blind, St. Augustine, Florida

Mr. Jerry Vandergrift, Educational Supervisor, Florida School for the Deaf and Blind, St. Augustine, Florida

### Science

Dr. Elva R. Gough, Vision Specialist, DeKalb County Public Schools, Smithfield, Tennessee

Mrs. Rebecca Hunton, Science Teacher, Indiana School for the Blind, Indianapolis, Indiana

### Teacher Evaluators

Mr. Donald Banning, Resource Teacher, J. V. Fairchild Junior High School, Jefferson, Louisiana

Mrs. Margaret Ritchie, Vision Supervisor, Pasadena Unified School District, Pasadena, California

Ms. Marsha Williams, Itinerant Teacher, Vista Unified School District, Vista, California

### Social Studies

Mr. Tom Anthony, Orientation and Mobility Instructor, Houston Independent School District, Houston, Texas

Mrs. Catherine Carrigan, Elementary Teacher, Kaiser Elementary School, Houston, Texas

Mrs. Mary Nelle Council, Social Studies Teacher, Tennessee School for the Blind, Nashville, Tennessee

Ms. Cyral Miller, Elementary Teacher, Reilly Elementary School, Austin, Texas

Dr. Jack Miller, Professor, George Peabody College for Teachers, Nashville, Tennessee

Mrs. Janie Tomlin, Elementary Teacher, Kaiser Elementary School, Houston, Texas

Tactile Graph Instructional Program

Mr. Anthony Evancic, Educational Supervisor, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Ms. Dixie Howser, Mathematics Teacher, Kentucky School for the Blind, Louisville, Kentucky

Ms. Stephanie Richards, Mathematics Teacher, Indiana School for the Blind, Indianapolis, Indiana

Ms. Margaret Ritchie, Mathematics Teacher and Vision Supervisor, Pasadena Unified School District, Pasadena, California

Dr. Charles Thompson, Associate Professor, Department of Early and Middle Childhood Education, University of Louisville, Louisville, Kentucky

Mr. Timothy Yerian, Itinerant Teacher (Social Studies, Science), Hamilton County Public Schools, Hamilton County, Ohio

Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students (0-36 months)

Mrs. Pat Carpenter, Supervisor, Programs for the Visually Handicapped, DeKalb County Schools, Scottdale, Georgia

Dr. Marvin Efron, OT, PhD, Optometrist, Columbia, South Carolina

Mrs. Wilma Hull, Doctoral Student, Boston College, Chestnut Hill, Massachusetts

Miss Carolyn Jones, Teacher, Intervention Program for Deaf-Blind Students, University of Kentucky, Lexington, Kentucky

Dr. Julie Jones, Project Training Officer, Research and Training in Mental Retardation, Texas Tech University, Lubbock, Texas

Mrs. Irna Marshall, Infant-Parent Trainer, Washington Commission for the Blind, Seattle, Washington

Teacher Evaluators

Mr. Thomas J. Babeo, Teacher, Western Pennsylvania School for the Blind, Pittsburgh, Pennsylvania

Ms. Ellen Bernstein, Consultant, Virginia Commission for the Blind, Richmond, Virginia

Mrs. Sue Birkenshaw, Teacher, Utah State School for the Blind, Ogden, Utah

Ms. Lucille Burgess, Teacher, Whitten School for the Orthopedically Handicapped, Oakland, California



Mrs. Margaret Calvert, Infant Specialist, Elkhart County Rehabilitation,  
Elkhart, Indiana

Mrs. Denise Cook-Clampert, Teacher, Variety Club, Blind Babies Foundation, San  
Francisco, California

Mrs. Amie Dennison, Retired Teacher and Low Vision Specialist, Nashville,  
Tennessee

Mr. Steve DeRosa, Teacher, Education Service Center Region 20, San Antonio,  
Texas

Mrs. Joan Egyud, Supervisor, DuPage-West Cook Regional Special Education Asso-  
ciation, Lombard, Illinois

Ms. Carol Fishman, Teacher, New York Institute for the Education of the Blind,  
Bronx, New York

Mr. David Garland, Teacher, Cherry Knoll School, Traverse, Michigan

Miss Julia Harris, Educational Diagnostician, Child-Family Intervention Services,  
Western Carolina Center, Morganton, North Carolina

Mrs. Ruth Holmes, Low Vision Coordinator and Educator, Illinois School for the  
Visually Handicapped, Jacksonville, Illinois

Ms. Christine Kosky, Teacher, New York Institute for the Education of the Blind,  
Bronx, New York

Ms. Karen LaFollette, Preschool Visually Handicapped Counselor, Division of  
Eye Care, Augusta, Maine

Miss Debbie Lannom, Physical Therapist, Orange Grove School, Chatanooga, Ten-  
nessee

Ms. Susan Lemanowicz, Teacher, Buncombe County Special Services, Asheville,  
North Carolina

Ms. Susan Matthews, Teacher, Maury School, Fredricksburg, Virginia

Ms. Maura Puglio, Teacher, Western Pennsylvania School for the Blind, Pittsburgh,  
Pennsylvania

Ms. Jane Romines, Teacher, Alice E. Carlson Elementary, Ft. Worth, Texas

Mrs. Jannie Shapiro, Mobility and Low Vision Specialist, Oak Hill School, Hart-  
ford, Connecticut.

Ms. Ann Silverrain, Teacher, Education Service Center Region 20, San Antonio,  
Texas

Ms. Jean Small, Teacher, Division of Eye Care, Bangor, Maine

Ms. Pamela Small, Teacher, Maury School, Fredricksburg, Virginia

Mr. Bruce Smith, Teacher, Alice Carlson Elementary, Ft. Worth, Texas

Miss Barbara Surbutts, Teacher, Foster School, Braintree, Massachusetts

Mr. Phil Vedovatti, Vision Coordinator, Northwestern Illinois Association for  
Hearing, Visually, and Physically Handicapped, DeKalb, Illinois

Miss Pam Wyatt, Teacher, Harris-Hillman Public School, Nashville, Tennessee

Research and Developmental Personnel for FY 1981

|                       |                                |
|-----------------------|--------------------------------|
| Barth, John, PhD      | Research Scientist             |
| Bensinger, Sharon, BS | Research Assistant             |
| Berla', Edward, PhD   | Research Scientist (part time) |
| Caton, Hilda, EdD     | Research Scientist (part time) |
| Cundiff, Kerry, BA    | Editorial/Research Assistant   |
| Davis, Gary           | Mechanical Designer*           |
| Duckworth, Bill, MS   | Librarian/Research Scientist   |
| Franks, Frank, EdD    | Research Scientist             |
| Frere, Suzette, BA    | Research Assistant             |
| Glass, Robert, MEd    | Research Assistant             |
| Jacobi, Patricia      | Library Clerk/Clerk Typist     |
| Moore, Sheri, MS      | Research Scientist             |
| Morris, June, MA      | Director                       |
| Pester, Eleanor, MS   | Research Associate             |
| Poppe, Tom            | Model and Pattern Maker*       |
| Segovia, Mercia, PhD  | Research Assistant (special)   |
| Walsh, Jeannette      | Secretary                      |
| Willis, Deborah, BA   | Research Associate             |

\*Design and Development Section



Publications during Fiscal 1981

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- Barraga, N. C., & Morris, J. E. Program to develop efficiency in visual functioning: Diagnostic assessment procedure (Vol. 1). Louisville, Ky.: American Printing House for the Blind, 1980. (1978 copyright date)
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Publications during FY 1981

PATTERNS, THE PRIMARY BRAILLE READING PROGRAM

Readiness Level:

American Printing House for the Blind. Review worksheets to accompany go and do and letters and you: Patterns, the primary braille reading program. Louisville, Ky.: Author, n.d. (student materials)

Caton, H., Pester, E., & Bradley, E. J. go and do. Louisville, Ky.: American Printing House for the Blind, 1980. (student text)

Caton, H., Pester, E., & Bradley, E. J. letters and you. Louisville, Ky.: American Printing House for the Blind, 1980. (student text)

Caton, H., Pester, E., & Bradley, E. J. Teacher's edition to accompany go and do and letters and you: Readiness level, Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1980.

Pester, E., Modaressi, B., & Bensinger, S. (Eds.). Teacher's manual review worksheets: Referenced to readiness level go and do and letters and you: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, n.d.

Rankin, E. F. Posttest, readiness level: Criterion referenced to go and do and letters and you: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, n.d. (student materials)

Ranking, E. F. Teacher's manual possttest: Criterion referenced to readiness level go and do and letters and you: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1980.

Preprimer Level:

American Printing House for the Blind. Review worksheets to accompany work and play, little and big, words and games: Patterns, the primary braille reading program. Louisville, Ky.: Author, n.d. (student materials)

American Printing House for the Blind. Worksheets to accompany work and play, little and big, words and games: Patterns, the primary braille reading program. Louisville, Ky.: Author, n.d. (student materials)

Caton, H., Pester, E., & Bradley, E. J. Work and play. Louisville, Ky.: American Printing House for the Blind, 1980. (student text)

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Rankin, E. F. Posttest, preprimer level: Criterion referenced to work and play, little and big, words and games: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, n.d. (student materials)

Rankin, E. F. Teacher's manual posttest: Criterion referenced to preprimer level work and play, little and big, words and games: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1980.

#### Primer Level:

American Printing House for the Blind. Review worksheets to accompany city and farm: Patterns, the primary braille reading program. Louisville, Ky.: Author, n.d. (student materials)

American Printing House for the Blind. Worksheets to accompany city and farm: Patterns, the primary braille reading program. Louisville, Ky.: Author, n.d. (student materials)

Caton, H., Pester, E., & Bradley, E. J. City and farm (2 vols.). Louisville, Ky.: American Printing House for the Blind, 1980. (student text)

Caton, H., Pester, E., & Bradley, E. J. Teacher's edition to accompany city and farm: Primer level, Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1980.

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Rankin, E. F. Teacher's edition, posttest: Criterion referenced to primer level city and farm: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1981.













DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES  
FISCAL 1982

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Activities of the Department of Educational Research were generated by two pervasive concerns during FY 1982. The first was to expedite production of new products previously approved for production and the second was to continue development of new products to help alleviate the most critical needs for educational materials of visually handicapped students throughout the country. The scope of the Department's activities has included materials development projects for early childhood and multihandicapped, low vision, braille reading, mathematics, social studies, tactile graphics, and educational measures. Other activities have involved researching legibility of tactile displays and academic achievement of legally blind students. Throughout, support from the field--professionals, administrators, parents, and visually handicapped students themselves--has been invaluable. Additionally, the Department has had the full support of the Printing House's staff and its newly formed Educational Research and Development Committee. This Committee met in May 1982, when it reviewed and approved the Department's program. The research program has been supported by the Printing House's federal appropriation for research and development and three grants. These grants supported the following projects:

1. The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers

Special Education Program, U.S. Department of Education

2. A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Special Education Program, U.S. Department of Education

3. Fundamental Mathematics Concepts for Physically Handicapped Students

National Science Foundation

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Of primary concern is the anticipated reduction in funds for FY 1983. This includes a reduction in the federal appropriation for research and development and the termination of two of the grants. Meetings with U.S. Department of Education personnel in both the Special Education Program and the Rehabilitation Branch of the Division for Blind and Visually Impaired have indicated that monies will not be available from them to support new research and/or development activities in the near future. However, other sources will be pursued as needed. Implications for the research program for FY 1983 are that no expansion of staff or overall program are anticipated.

The staff of the Department has been stable and functioned well. The Educational Research Library and the Design and Development Section provide tremendous in-house support for all activities. Unlike conventional model shops in industry, the Department's Design and Development Section works to carry a concept completely through to manufacture. After ideas are refined and production prototypes constructed, tooling is built which is engineered to fit the specific capabilities and limitations of the American Printing House. More than ever, the success of products depends upon appropriate and cost-effective design, materials, and tooling. Gary Davis and Tom Poppe man the Design and Development Section. The professional library is the responsibility of Bill Duckworth and Gene Bolin.

Research personnel have met regularly with production staff throughout the year to expedite production of new products. New products produced during FY 1982 resulting from efforts of the Department include:

- KeyMath Diagnostic Arithmetic Test
- Microslide Cassette Program I
- Prevocational Skills Development Materials
- Continental Relief Map Cassette Program: North America
- Introduction to Map Study I
- Bold Line Writing Paper (redesigned)
- Patterns: First Reader Level
- Stanford Diagnostic Reading Test
- Audio-Tutorial Reference Materials in Biology
- Continental Relief Map Cassette Program: South America
- Microslide Cassette Program II

Other new products that will be ready for distribution early in FY 1983 are:

- The World Book Year Book 1980 and 1981, Recorded Edition
- Patterns: Second Reader Level
- Patterns Library Series: Preprimer Level
- Continental Relief Map Cassette Program: Europe
- 30-cm Flexible Ruler

Following is a summary of research and development activities for FY 1982 and a preview of anticipated activities for FY 1983.

## Early Childhood and Multihandicapped

### A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Work completed during FY 1982. The Home-Based Media project is targeted for visually handicapped children functioning from birth to 24 months, their parents, and home-based teachers. The project has three major components: tangible child-use items; a slide-cassette program; and a Resource Guide for parents and teachers. All three components aid in developing critical skills in the young visually handicapped child.

During the funding year, specifications were formulated and drawings made for each of three tangible items. These included an electronic, vinyl-covered mat which, when a child placed upon it makes movements, rewards him with pleasant tones. A second tangible item was an electronically activated headband and sensor, which plays a musical tune when the head is righted. Another item, a sophisticated electronic sensor attached to the head or wrist, would produce an auditory signal when the child locates a nearby object with a similar sensor attached to it. The American Printing House's new products development staff and a consulting electrical engineer assisted project staff in locating materials needed for the tangible prototypes. Mike Moore and Cullen Sloane, of the Printing House staff, built two prototypes of the mat and headband. The electronic hand sensor proved to be a difficult item to construct, so an electrical engineering firm was consulted. It was not successful in developing a cost-effective, reliable prototype after several months' work. This item subsequently was dropped.

The media component, a slide-cassette program, demonstrates how parents can teach their young visually handicapped child through everyday activities. Photographing of the family and child for the slides proved time-consuming. The media component has been developed with the technical support and expertise of Annette Rich, Director, and Cliff Pogue, Media Specialist, of the Central Pennsylvania Special Education Resource Center. The family photographed, Dr. and Mrs. Raymond Joehl and their five children, live in Hummelstown, Pennsylvania.

The third component reinforces and augments concepts and suggestions introduced in the slide-cassette program. This Resource Guide gives extensive information to teachers and parents on scheduling, sensory stimulation, medical concerns, choosing an educational program, playing, parenting, and guidelines for teachers and parents in home-based programs.

The Home-Based Media program was formatively evaluated by both teachers and parents. Each of the three components was critiqued in the areas of quality, usefulness, durability, safety, content, organization, and age appropriateness. Evaluative data were compiled



and analyzed to determine necessary modifications and revisions; a meeting of project consultants was subsequently held. The consultants assisted in designing revisions for the three program components. Modifications recommended for the sensory mat included the installation of a timed circuit breaker, a change of power source to battery, and the addition of a textured cloth overlay. The head-band device needed to be modified for continuous music cycling. Changes are to be made in the slide-cassette program on the musical background and narration and more slides of the father and siblings are to be added. The Resource Guide will be greatly expanded to include additional content areas.

Work planned for FY 1983. Revisions underway will be completed, and 12 sets of all three of the program components will be constructed for field evaluation purposes. Field testing sites will be identified and evaluation forms constructed. The field evaluation will elicit the input of both teachers and parents. Results will be compiled and analyzed and necessary revisions designed. Preparation for production will be initiated. A final report will be written detailing total project development efforts. Sheri Moore directed the project, assisted by Sharon Bensinger, Kerry Cundiff, and Suzette Frere.

#### Materials for Multihandicapped Students--Needs Assessment Meeting

Work planned for FY 1983. The last assessment meeting for determining educational materials needs for multihandicapped visually impaired students was held 5 years ago during FY 1978. Research staff members have systematically developed the materials prioritized at the 1978 meeting. During FY 1983, another meeting will be held to determine current materials needs for the multihandicapped population. Sheri Moore will direct the needs assessment meeting, assisted by Sharon Bensinger and Suzette Frere.

#### Low Vision

##### Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students (birth-36 months)

Work completed during FY 1982. The Vision Stimulation and Training Materials were presented at the 1981 Annual Meeting, at which time they were approved for production. Since that time, preparations have been underway for the materials to enter the production phase. Final revisions were made and specifications and component-source lists formulated.

Work planned for FY 1983. Production prototypes will be constructed and tooling built by the Design and Development Section. Following this, all materials will receive a final expert review. The materials will also be submitted to U.S. Testing Laboratories for safety evaluation. The project leader, Sheri Moore, is assisted by Sharon Bensinger and Suzette Frere.

## Light Box and Light Box Materials: Level I

Work completed during FY 1982. The Level I materials were designed for students functioning from birth to 4 years. Field evaluation of the Light Box and accompanying Light Box Materials: Level I was completed during the summer of 1981. Five teachers of visually handicapped and multihandicapped visually impaired students functioning from 3 months to 4 years used the materials for 7-9 week periods. All of the teachers evaluated the Light Box as being safe and commented favorably on its overall design, functioning, and portability. One improvement was suggested: a means of keeping the bulb securely in its socket during shipping and rough handling. The accompanying Level I Materials were also evaluated as being safe and durable. With the exception of the Threading Shapes and Rattle, the evaluators unanimously recommended each test item be produced and sold in the Level I kit. The items in the field evaluation kit were:

1. Acetate Backgrounds
2. Tracing Backgrounds
3. Form Backgrounds
4. Plexiglas Blocks
5. Plexiglas Spinner
6. Face Puzzle
7. Ball Puzzle
8. Threading Shapes
9. Tumblers
10. Rattle

The Activity Guide which accompanies the Light Box Materials--Level I was considered helpful. Evaluators suggested that the activities be organized by skill rather than grouped according to kit item.

Following the field evaluation, the Light Box and Level I Materials were reviewed by the project's primary consultant. Her assessment agreed with those of the teacher-evaluators. Most significantly, she reordered activities in the Activity Guide by skill and placed them in a rough developmental sequence.

Based on the results of the field evaluation and expert review, it was determined that the Light Box and kit materials be marketed as two separate products. The Rattle was dropped from the Level I Materials and a few of the items were redesigned slightly, for example, the features of the face puzzle were redrawn. A slip-cover for the Light Box and vinyl shoulder bag were selected for packaging.

The Light Box and the Level I Materials were approved for production at the 1981 Annual Meeting. Since that time, tooling for the Level I Materials has been completed. Draftsman's drawings of the items were made and a 20-page set of specifications distributed to departments involved in their production. A final draft of the Activity Guide was edited and illustrated, and is ready for printing.

Work planned for FY 1983. A revised mold of the Light Box will be made which will hold the bulb firmly in place. Once completed, the revised Light Box will be sent to Underwriters Laboratories for safety testing. The Level I Materials will be evaluated for safety by U.S. Testing Laboratories. Suzette Frere has been responsible for this project. Tom Poppe designed the Light Box.

#### Light Box Materials: Level II

Work completed during FY 1982. The Light Box Materials: Level II, intended for students functioning from 4-6 years of age, were suggested by evaluators of the Level I Materials. The high degree of contrast provided by the Light Box and their students' interest in working with it persuaded evaluators that teaching of complex visual discrimination tasks could be simplified using the Light Box. They specifically requested materials to teach picture-to-picture matching and letter recognition.

Development of these materials began in March 1982. After a review of the literature in the areas of visual development, visual perception and learning, reading readiness, primary reading, and low vision training, approximately 50 visual tasks appropriate for performance on the Light Box at the 4-6 year functional level were identified. A questionnaire was mailed to 53 teachers of visually handicapped preschool, kindergarten, and first grade students. They were asked which of the 50 objectives should be addressed by the Level II Materials, and which, of these, were the most important. Results of the questionnaire were compiled and materials ideas proposed based upon them. The suggestions include:

1. Acetate Worksheets for matching colored pictures of single objects, shapes, outline shapes, and letters.
2. Acetate "Playing Cards" for games which require the child to match, identify, and remember pictured objects, shapes, and letters; these include "Rummy," "Bingo," "Lotto," an altered form of "Dominoes," and "Concentration."
3. Acetate Board Game involving visual matching and movement of tokens around a board.
4. Acetate Story Scenes requiring the child to identify elements of a larger picture and correctly position cut-out pictures of objects to go with a story about them.
5. Acetate Overlays and Grounds for figure-ground discrimination exercises.
6. Acetate Picture Cards and Overlays for presenting objects with a missing part which the child must identify--overlays supply missing parts.



7. Pegboard with Colored Acrylic Pegs to be used for sequence and pattern-making activities.
8. Acetate Worksheets and Colored Markers for a variety of tracing, handwriting, and dot-to-dot exercises.

Work planned for FY 1983. Two consultants will meet with the project's staffperson to discuss additional ideas for materials, determine which materials should be developed, and write detailed specifications for them. Prototypes of the materials will be constructed and will undergo a formative evaluation. Following indicated revisions of the materials, they will be field tested. Suzette Frere is responsible for this project.

## Reading

### Beginning Braille Reading Series

Work completed during FY 1982. Work on Patterns: The Primary Braille Reading Series is nearing completion. Field testing of the Second Reader Level of Patterns was completed in November of 1981. The Second Reader materials were revised based on the evaluations and the field testing and prepared for production. The Second Reader Level is scheduled for sale in September 1982. Field testing of the Third Reader materials continued with six more pupils completing the program, for a total of 12 to date. Data from the production posttests Readiness through First Reader Levels were solicited for follow-up item analyses. Although results are not all in, teachers have been most cooperative and the responses look encouraging. Copyrights were applied for and received on all materials on the Readiness, Preprimer, Primer, and First Reader Levels of Patterns.

Work planned for FY 1983. Field testing of the Third Reader Level of Patterns will be completed, after which the program materials will be revised, and prepared for production. Data from the production posttests will continue to be solicited and analyses of the data will be made when a sufficient number of results for each level have been received.

Hilda Caton and Eleanor Pester are responsible for this project. They are assisted by Sharon Bensinger, Kerry Cundiff, and Mercia Segovia. Eddy Jo Bradley serves as the directing editor. Nancy Pitt, an American Printing House stereograph operator, works with the project staff on preparing the special braille plates required.

### Patterns Power Library

Work completed during FY 1982. Work continued on development of the Preprimer Level of the Patterns Power Library, which will be called the Patterns Library Series. Following review by staff and three outside evaluators, the material in the original 15 books was

reorganized into 24 books, ranging from 10 to 34 pages in length. Other revisions based on the reviews were made and the books were prepared for production. Twenty-eight books were written for the Primer Level, reviewed by the staff, and prepared for outside review. The search for appropriate commercial children's library books to use in the First, Second, and Third Reader Levels of the Patterns Library Series began.

Work planned for FY 1983. Following the review of the Primer Level, the materials will be revised and prepared for production. Selection of appropriate books for the First, Second, and Third Reader Levels will continue. Notes for Teachers will be prepared for each of these levels and editing will be done when necessary. The review procedure already established will be used for each level in succession. At this time, it is projected that the development of all five levels of the Patterns Library Series will be completed during the year.

Eleanor Pester is responsible for this project. She is assisted by Eddy Jo Bradley, the directing editor of Patterns.

#### Braille Reading Program for Late Blinded

Work planned for FY 1983. The major purpose of this project is to develop a set of braille training materials designed to teach reading to persons who lose their vision after having received initial reading instruction in print. The need for such a program has been voiced in Patterns workshops as well as having been identified as a high priority need for rehabilitation programs. At the present time, plans are to develop a program consisting of four levels. These are:

- Level I - Materials will include instruction of braille for life skills (e.g., numbers, following directions on packages, etc.).
- Level II - Grade 2 braille will be introduced, beginning with one-shape braille units.
- Level III - This level will teach the remainder of the grade 2 braille units.
- Level IV - Dictionary skills and the specific rules of grade 2 braille will be taught.

Each level will consist of a teacher's manual and student practice materials in worksheet form. All training materials will be adult-oriented. Students will begin at Level I and complete only as many levels as desired to fit their life styles.

Work on this project will be initiated during the year. Hilda Caton will direct the project.

## Mathematics

### Fundamental Mathematics Concepts for Physically Handicapped Students

Work completed during FY 1982. The intent of this project is to develop manipulative materials and/or alternative instructional approaches for establishing a mathematics content base for legally blind students, most of whom are consistently low achievers in mathematics. Two subcategories of students also are addressed: legally blind students with severe hearing losses and legally blind students with additional handicapping conditions.

The American Printing House was fortunate in receiving funding for the Fundamental Math project from the National Science Foundation. The project was scheduled to begin July 1, 1982. The first phase was to cover a 14-month period. Notification of funding came in September 1981 and the first meeting to initiate the drafting of project materials by the director and staff took place in November.

Writing sessions to develop instructional activities were held with the project director, consultant-developer Sandra Albrecht, and project consultants at the Florida School for the Deaf and the Blind where the materials are being developed. Subsequently, preliminary meetings were held with experts on physical handicapping conditions to allow them initial input to the project. The consultants generally accepted and endorsed the program. They had reviewed the activities format, some 30 activity modules, prior to the meeting and made comments and suggestions for consideration in development of project materials. These included:

1. Approval of the format for use in field evaluation of the materials.
2. Approval of the overall content objectives with suggestions for extension of some concepts and the addition of others (none was deleted).
3. Tentative agreement that three proposed manuals be explored: one for academic blind students, one for blind students with severe hearing losses (deaf/blind), and one for blind students with additional physical handicapping conditions.
4. Ann Swanson (Science Department Chairperson, Edgewood College, Wisconsin) supported a "functional" approach--that additional physical disabilities be considered relative to their effect on instruction, rather than placing emphasis on etiology.
5. Dan Burch (Manual Communications Expert, Delgado Community College, New Orleans) and Harry Lang (Physics professor, Rochester Institute of Technology, Rochester, New York) indicated that more "pre-teaching" emphasis may be necessary for blind students who are hearing impaired. Mr. Burch emphasized the importance of the program for mathematics language (scientific literacy) development.



6. Dan Burch and Harry Lang would like to see the program made available for deaf students, if possible.

Sessions also were held with mathematics content experts on the project. They generally accepted the suggestions and comments made by the specialists. The critical item of discussion with them was determination of the stopping point for the project, in view of the need to keep the project manageable (and palatable for teachers who will use the materials). There was agreement to end the project with entry "pegs" to multiplication and division. While young blind students may not be able to comprehend operations in multiplication and division, some older students may. Since addition, subtraction, multiplication, and division are fundamental operations, the four should be addressed, even if not with the same depth of coverage.

In final writing sessions at the American Printing House, some 160 activities were completed and sequenced into a program for field evaluation. Specifications were set for the accompanying instructional aids. Preliminary field evaluation sites in eight states were designated, with additional sites under consideration.

Work planned for FY 1983. The major activity planned for FY 1983 will be field evaluation of the materials by teachers who will use the programs with students in residential and day schools. Handicapped students in three categories will use the materials: academic blind students in day school classes, blind students with severe hearing losses, and blind students with additional handicapping conditions. Eight educators from each category will participate. On-site observations, meetings, and interviews will occur. Plans for in-service programs and teacher workshops will be developed. The content experts will critique the materials to ensure that the basic mathematics content is accurate. Bob Glass is assisting Frank Franks with the project.

#### Base 10 Materials in Mathematics

Work completed during FY 1982. This project developed as a legibility study within the Fundamental Mathematics project. The materials included a number of the 1-cm cubes and 10-cm sticks included in the Base 10 kit. The field evaluation focused on manipulation tasks performed by young blind students. The experimental design of the study required the participation in two sessions of 48 screened subjects evenly divided according to age (5-6 years vs. 7-8 years), sex, and visual orientation (visual vs. tactual). The procedure was refined through pilot trials. The data suggest that the younger, nonvisual student may require materials adaptation and/or additional training materials to attain an acceptable level of performance on basic manipulative tasks using these materials. Bob Glass was responsible for this project.

## Social Studies

### Introduction to Map Study: The Globe

Work completed during FY 1982. The Map Study program was developed as a supplementary teaching aid for introducing basic globe concepts to young blind students at the K-2 level. The program is also useful for remediation with older students. The sequence of activities follows the "near to far" pattern of map study--expanding the student's horizons by beginning with his immediate environment and moving out to the school community and finally, the world community. This approach is traditional, especially at the elementary grade level. The activities follow a K-2 sequence presentation in four areas: scale and distance; symbols; shape and size; and orientation (location and direction). They are presented in three levels, progressing from the concrete to the abstract.

Level I activities (Lessons 1-9) develop environmental awareness through observing and exploring natural and cultural geographical features. Locational and directional referents are used in the student's environment prior to their use on the globe. Environmental representation is introduced with the use of toys and models of real objects. Level II activities (Lessons 10-18) utilize locational and directional referents on the globe. Emphasis is on the development of globe skills and concepts with the use of the Simplified Continental Relief Map of North America. Level II activities (Lessons 19-27) apply the basic skills and concepts presented in the sequence. The student demonstrates his acquisition of these skills and his knowledge of globe generalizations by performing the tasks presented in the activities.

The instructional materials comprise a student activities guidebook, a 12-inch geo-physical globe which can be rotated in a stand, and two smaller globes. The guidebook contains information for the teacher, student activities, and Globe Concept and Skill Analysis tasks for administration to the student upon completion of the program. A Simplified Continental Relief Map of North America is an essential component of the program.

The globe instructional materials were evaluated by eight teachers with primary-grade blind students in mainstream settings. Preliminary inspection of the teacher evaluations indicated that the students were able to proceed through the activities and perform the entry level tasks with ease. Performance was greatly enhanced with the stability of the globe mounted in the stand. Students did not lose orientation with each new task as previously when using the globe in the cradle. Although the globe was reported top-heavy for the stand, teachers indicated that map legibility was adequate for the concepts introduced.

Work planned for FY 1983. Materials in the program will be finalized and presented for production approval. Bob Glass and Frank Franks are working on this project.

## Tactile Graphics

### Legibility of Incised Areal Patterns

Work completed during FY 1982. A study by Berlá and Murr in 1975 showed that the inclusion of raised areal patterns in a tactile political pseudomap decreased the speed and accuracy of locating point symbols and increased the time needed to track lines. In 1979 Barth obtained a similar result in a study involving tactile line graphs. On the average it took students 153% longer to trace a line (data curve) embedded in a pattern of raised grid lines than through a smooth background. A solution to this "tactual noise" problem might be realized by a change in the way tactile displays are designed. At present, all tactile elements in a display are raised above the surface. A better design might involve the selective use of both raised and incised tactile elements. Such a scheme was employed by Barth in 1981 in a study involving tactile graphs. In that study, the use of an incised grid significantly improved graph reading performance over the level achieved with a raised grid.

It might be conjectured that a similar enhancement of performance could be realized with other types of displays, such as maps and diagrams, by employing incised tactile elements in the composition of areal patterns. Since no information is available on sets of discriminable incised areal patterns or on parameters important in the discriminability of incised patterns, a study was conducted to identify characteristics which contribute to discriminability. Being exploratory in nature, this study examined a multitude of design parameters involving the pattern elements, including continuity, width, shape, and density. A pair-comparison technique was used to examine the legibility of 22 various patterns. Thirty braille readers in grades 4-8 served as subjects. Criteria for a pattern's inclusion in the discriminable set were (a) that when paired with any other pattern in the set, less than 10% of the students failed to recognize it as being different, and (b) that when paired with itself, less than 10% of the students failed to recognize it as being the same. Of the 22 patterns tested, 10 met these criteria.

Work planned for FY 1983. A study will be conducted to compare the effects of raised and incised patterns on various aspects of display reading performance, such as line tracking and point symbol location. The design of these displays will probably involve the pseudomap paradigm employed in previous research conducted by the American Printing House. The incised patterns used will consist of mutually discriminable patterns identified in the previous study. If incised patterns are found to facilitate display reading performance, it will be recommended that they be incorporated into the design of the new plate embossing system now being developed. John Barth is responsible for this project. He is assisted by Debbie Willis.



### The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers

Work completed during FY 1982. The purpose of this program, now entitled Tangible Graphs, is to turn blind students into competent graph readers through a carefully sequenced instructional approach. Fundamental graph reading skills and concepts are introduced in small steps, with each new step building upon previous ones. The student is thus brought along slowly from elementary skills such as tactual discrimination and line tracking to more advanced skills such as the interpretation of bar graphs and multiple line graphs. The program is replete with tangible graphic displays. Approximately half of them are embossed in paper and half in plastic to give the student practice with both media. Accessory materials that allow the student to construct his or her own graphs are also included in the instructional package. After completing the program, the student should be able to interpret all four main types of graph: pictograph, bar graph, circle graph, and line graph. It is also expected that the program will have some positive carry-over effects to the reading of other types of tangible displays, such as maps and diagrams.

During FY 1982 a draft of the instructional program was completed. Several sources of information were taken into account as the content and design of the program text were developed:

1. Skills, concepts, and graph types (ordered in terms of difficulty) identified during the 1st year of the project.
2. Existing graph programs for the sighted.
3. Data collected during the pilot of the graph test that will accompany the program.
4. Research studies concerned with the reading of tactile graphics.
5. Recommendations of consultants.

This draft was reviewed by five project consultants (teachers of visually handicapped students from residential and public school programs) at a meeting held in Louisville. Some of the areas addressed during this review process included: (a) the sequence in which skills and concepts were developed, (b) omission of important skills or concepts, (c) inclusion of unimportant skills or concepts, (d) underdeveloped or overdeveloped treatment of specific skills or concepts, (e) poor wording; language too difficult for 5th grade level, (f) format, (g) appropriateness and interest level of graph examples, and (h) legibility and design of the tactile displays. Based on the consultants' input, the program was then revised.

All materials contained in the revised program package were reproduced in quantities needed for the field evaluation. The program package includes: (a) student's copy of the program in Grade 2 literary braille, (b) Teacher's Guide--a complete print version of the program, interspersed with additional graph reading information, (c) materials (cork board, pins, rubber bands, embossed grids) for graph construction by students, and (d) multiple-choice test for assessing a student's mastery of graph skills and concepts. Finally, a questionnaire was developed for use by teachers in the field evaluation. This questionnaire addresses all areas of the program's design and content.

Work planned for FY 1983. The primary objective of the final phase of the project is to evaluate the efficacy of the instructional program by having students and teachers use it. Teachers in both public and residential school programs for the visually handicapped will be sent copies of the instructional program, the Teacher's Guide, the graph test, and the evaluation questionnaire. It is expected that 10 areas in North America will be involved in the field evaluation: Arkansas, California, Connecticut, Illinois, Michigan, Missouri, North Carolina, Utah, Washington, and Ontario, Canada. The actual number of sites will be approximately 23. Six of these are residential school settings and the rest are public school settings.

Each participating student will be required to complete the graph test at the outset of the study. For half of the students, this will be followed by 3 months of instruction using the graph program. All students will then take the graph test once more. The teacher will critique the graph program by completing the evaluation questionnaire and making comments in the text.

In all, a minimum of 30 students will receive instruction in graph interpretation. Another group of 30 students will be given both the test and retest but no instruction, thus serving as a control against which to determine the effects of the instructional program. Half of the students in each group are from grades 5-7, the other half from grades 8-10. Approximately 47% of the participating students are from public school programs and 53% from residential school programs. All of the students are of normal intelligence, have used braille as their primary mode of reading for a minimum of 3 years, and have no debilitating physical handicaps other than impaired vision.

Following the field testing, appropriate statistical analyses will be used to determine whether use of the instructional program resulted in the acquisition of tactile graph reading skills and concepts. These analyses will involve an examination of the gains made by the trained (experimental) subjects from pretest to posttest, as well as a comparison between the test performances of the trained and untrained (control) subjects.

The results of the data analyses, together with the teacher's critiques, will be used to compose a final version of the instructional program. A meeting of an in-house advisory committee will be convened to assist in this endeavor. The final version will then be readied for production. John Barth is responsible for this project. He is assisted by Edward Berlá and Debbie Willis.

#### Plate Embossing System for Tactile Graphics

Work completed during FY 1982. The purpose of this project is to upgrade the quality of the tactile graphic displays that the American Printing House produces in a paper medium. Construction of the system's primary machine began in February, 1982. This machine, the most complex component of the system, will produce the linear symbols and some of the areal patterns.

Work planned for 1983. During the coming year, the primary machine and other components of the system will be constructed. These consist of (a) a machine that will produce the point symbols and the remainder of the areal patterns, and (b) the punch and die sets needed by both machines to produce given symbols. Test sets of point, linear, and areal symbols will be identified. Legibility testing of these sets of tactile symbols will be conducted with braille readers in grades 4-9 serving as subjects. Based on the data obtained in this study, legible symbols from each symbol class will be identified for inclusion in the working system. Gary Davis and John Barth are responsible for this project.

#### Educational Measures

##### Stanford Achievement Test: 1982 Edition

Work completed during FY 1982. This test series is similar in format to the 1973 edition. Braille and large type editions will be provided for seven levels (Primary 2, Primary 3, Intermediate 1, Intermediate 2, Advanced, Test of Academic Skills 1, and Test of Academic Skills 2) in both forms (E and F). Special directions for administering will be required for the braille and large type editions of the series.

The Standardization Edition of the 1982 series arrived late in 1981. The tests were edited for braille and camera-ready copies were ordered for use in producing the large type test. Two finished sets of the special directions were submitted to Psychological Corporation for approval of format and wording. This approval was received.

Work planned for FY 1983. All components of the Stanford Achievement Series will be completed and submitted to the Editorial Department for production. This test series should be available for use in late 1982. Bill Duckworth is responsible for this work. He is assisted by Kerry Cundiff.



### Diagnostic Test of Grade 2 Literary Braille

Work completed during FY 1982. Work began on the development of a Diagnostic Test of Grade 2 Literary Braille for students in grades 4-12. Its major purposes are to measure students' knowledge of the grade 2 literary braille code, identify specific problem areas, and provide suggestions for remediation in these areas. The test will consist of:

1. An Observational Checklist to evaluate the mechanics of braille reading (hand position, etc.)
2. Approximately nine subtests based on the categories of the braille code developed for use in Patterns: The Primary Braille Reading Program.

The following initial steps in the developmental stage of the project have been completed:

1. A thorough review of the literature related to the braille code as it applies to tests.
2. A review of previously developed tests of the grade 2 literary braille code.
3. Writing of a set of specifications for the test.
4. Writing of items to be used in the item pool for the first phase of the field trial.
5. Pilot testing for evaluation of format and clarity of teacher directions and for standardization of testing procedures.

Work planned for FY 1983. During the next phase of development of the Diagnostic Test of Grade 2 Literary Braille, data will be collected to enable the choice of items from the item pool for an experimental edition of the test. The test directions will be written early in this period and the field trial of the experimental edition is planned. Bill Duckworth and Hilda Caton are responsible for this project. They are assisted by Sharon Bensinger. Earl Rankin serves as an expert test consultant and Eric Hamp as linguistic consultant.

### Battery of Performance Tests

Work completed during FY 1982. Joan Chase, of Rutgers Medical School, is developing a battery of performance tests for use with school-age visually handicapped persons. The need for a performance measure to complement verbal intelligence scales was one of the test needs documented at the most recent educational needs meeting sponsored by the Printing House. Research staff met with Dr. Chase to

review prototypical test materials, provide technical support regarding the materials, and explore ways of collaborating on further development and evaluation of the battery. The five subtests proposed are Block Design, Gollen Haptic Forms, Puzzle Squares, Coding, and Situations.

Work planned for FY 1983. After limited data are collected by Dr. Chase, research staff will meet again with her to consider the feasibility of further development of the battery. If it looks promising, ways of funding and collaborating on its further development and evaluation will be explored. June Morris is in contact with Joan Chase regarding this performance battery.

#### Educational Measures Needs Meeting

Work planned for FY 1983. A needs meeting in the area of Educational Measures will be held. Testing corporations have already been canvassed for information on their most widely used tests. These tests will be reviewed during this planned meeting. Bill Duckworth will direct the needs assessment meeting.

#### Academic Achievement of Legally Blind Students

Work completed during FY 1982. Previously recorded data on age and grade deviations on the Stanford Achievement Tests for 369 legally blind students were analyzed and graphed. The purpose of this study was to compare performance of legally blind students with that of their sighted peers.

Work planned for FY 1983. A report of this study will be prepared. Debbie Willis is responsible for the study.

### Other Research

#### Rehabilitation Needs Meeting

Work completed during FY 1982. A meeting was held to investigate specific materials needs of agencies providing training programs for visually handicapped clients. With recommendations from members of the Printing House's Administrative Committees, 11 administrators and instructors were selected to participate. Nine were able to attend.

The committee developed a preliminary list of needs containing nearly 80 items. These were categorized under four headings: communications, mathematics, daily living materials, and other needed materials. It was the wish of the group that the preliminary list be reviewed by their staffs for additional input. Consequently, the preliminary list was circulated and returned. A revised list was then developed and sent to the participants so they might rate the

importance of the identified needs. Results were tabulated and a report written. The high priority needs appropriate for the American Printing House to address fell in two categories: (a) adult-oriented braille training and practice materials, and (b) recorded self-instructional modules with information on survival skills, first aid, safety, house-keeping, etc. Initial efforts will be made during FY 1983 toward developing materials for use by rehabilitation programs. June Morris and Bob Glass were responsible for this needs analysis.

#### The World Book Year Book 1980 and 1981, Recorded Edition

Work completed during FY 1982. In April 1982, plans were finalized with World Book--Childcraft International, Inc. for producing a combined 1980-1981 Year Book to accompany The World Book Encyclopedia, Recorded Edition. It is anticipated that a combined Year Book will be produced every other year.

A meeting with World Book staff was held in Chicago in May to decide the material and the format to be used. The material to be included came from the Chronology and Year on File sections of both the 1980 and 1981 Year Books. Some selected articles from the Supplemental sections were also recorded. These Year Books cover the events of 1979 and 1980.

Specifications for both editing and indexing the combined Year Book were decided upon and work began in late May. Printing House staff members from various departments--large type, braille recording, tape duplication, business, etc.--held progress meetings periodically.

The completed Year Book is contained in one volume which includes the braille and large type indexes and 12 cassettes. Sharon Bensinger was assisted by Debbie Willis on this project.



Agencies Participating in Research during FY 1982

Cerebral Palsy Center, Children's Hospital; Cincinnati, Ohio  
Children's Hospital; Columbus, Ohio  
DuPage-West Cook Regional Special Education Association; Lombard, Illinois  
Prospect School; Clarendon Hills, Illinois  
West Leyden High School; Northlake, Illinois  
Education Service Center Region 15; San Angelo, Texas  
Einstein School; Hanover Park, Illinois  
Foundation for Junior Blind; Scottsdale, Arizona  
Illinois School for the Visually Impaired; Jacksonville  
Indiana School for the Blind; Indianapolis  
Jefferson County Public Schools; Louisville, Kentucky  
Jefferson Parrish Schools; Harahan, Louisiana  
Kentucky School for the Blind; Louisville  
Louisiana School for the Visually Impaired; Baton Rouge  
Meyer Children's Rehabilitation Institute, Multihandicapped Program; Omaha,  
Nebraska  
Mississippi School for the Blind; Jackson  
Missouri School for the Blind; St. Louis  
New Mexico School for the Visually Handicapped; Albuquerque Office  
New York Association for the Blind; New York  
Nina Harris Exceptional Student Education; Pinellas Park, Florida  
Oregon State School for the Blind; Salem  
Orleans Parrish Schools; New Orleans  
Redwood School; Fort Mitchell, Kentucky  
South Metropolitan Association; Dolton, Illinois  
Utah School for the Blind; Ogden  
Virginia Department for the Visually Handicapped; Richmond

Consultants during FY 1982

Beginning Braille Reading Series

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago,  
Chicago, Illinois

Miss Freda Henderson, Curriculum Director (Retired), Tennessee School for the  
Blind, Monkton, Maryland

Mrs. Alice Queenon, Teacher (Retired), Missouri School for the Blind, St.  
Louis, Missouri

Dr. Earl F. Rankin, Professor, Department of Curriculum and Instruction,  
University of Kentucky, Lexington, Kentucky

Dr. Mila B. Truan, Teacher, George Peabody College for Teachers and Tennessee  
School for the Blind, Nashville, Tennessee

Teacher Evaluators:

Miss Helen Berry, Primary Teacher, Missouri School for the Blind, St. Louis,  
Missouri

Mrs. Dorothy Ferry, Primary Teacher, Illinois School for the Visually Impaired,  
Jacksonville, Illinois

Ms. Diana Hill, Regional Special Education Teacher, Prospect School, Claren-  
don Hills, Illinois

Ms. Linda Morris, Resource Teacher, Einstein School, Hanover Park, Illinois

Mr. Tim O'Shaughnessy, Regional Special Education Teacher, West Leyden High  
School, Northlake, Illinois

Ms. Rosemary Paskas, Special Teacher, Missouri School for the Blind, St.  
Louis, Missouri

Mrs. Louidean Ray, Intermediate Teacher, Missouri School for the Blind, St.  
Louis, Missouri

Mrs. Mary Helen Welsh, Primary Teacher, Kentucky School for the Blind, Louis-  
ville, Kentucky

Diagnostic Test of Grade 2 Literary Braille

Mrs. Sarah Ashman, Psychologist, Indiana School for the Blind, Indianapolis,  
Indiana

Dr. Eric Hamp, Professor, University of Chicago, Chicago, Illinois

Mrs. Freda Henderson, Curriculum Director (Retired), Tennessee School for the Blind, Nashville, Tennessee

Dr. Earl Rankin, Professor, Department of Curriculum and Instruction, University of Kentucky, Lexington, Kentucky

Fundamental Mathematics Concepts for Physically Handicapped Students

Mrs. Sandra Albrecht, Early Childhood Specialist (formerly with the Florida School for the Deaf and the Blind), St. Augustine, Florida

Mr. Daniel Burch, Communications Specialist, Delgado Community College, New Orleans, Louisiana

Mr. Anthony Evancic, Educational Supervisor, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Dr. E. Glenadine Gibb, Professor of Mathematics, The University of Texas, Austin, Texas

Dr. Harry Lang, Associate Professor, National Technical Institute for the Deaf, Rochester Institute of Technology, Rochester, New York

Dr. Evelyn Neufeld, Associate Professor, School of Education, San Jose State University, San Jose, California

Dr. Ann Swanson, Chairman, Department of Physical Science, Edgewood College, Madison, Wisconsin

Mr. Tuck Tinsley III, Interim President and Mathematics Specialist, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mr. Jerry Vandergrift, Educational Supervisor, Florida School for the Deaf and the Blind, St. Augustine, Florida

Teacher Evaluators:

Ms. Diana Peebles, Elementary Teacher, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mr. Frank Wadler, Deaf-Blind Program, Florida School for the Deaf and the Blind, St. Augustine, Florida

Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Dr. Natalie Barraga, Professor, University of Texas, Austin, Texas

Mrs. Margaret Calvert, Infant Specialist, Elkhart County Rehabilitation, Elkhart, Indiana



Mrs. Pat Carpenter, Supervisor, Programs for the Visually Handicapped, DeKalb County Schools, Scottdale, Georgia

Mrs. Jan Cooper, Parent, Duncanville, Texas

Dr. Marvin Efron, Optometrist, Columbia, South Carolina

Dr. Verna Hart, Professor, University of Pittsburgh, Pittsburgh, Pennsylvania

Mr. Tim Hewitt, Electrical Engineer, Timark Corporation, Indianapolis, Indiana

Mr. Stanley Hertel, Electrical Engineer, Hertel Engineering, Louisville, Kentucky

Mrs. Julia Joehl, Parent, Hummelstown, Pennsylvania

Mrs. Marcia Klafter, Parent Media and Library Director, Eastern Pennsylvania Instructional Resource Center, King of Prussia, Pennsylvania

Mrs. Irna Marshall, Parent-Infant Trainer, Washington Commission for the Blind, Seattle, Washington

Mr. Cliff Pogue, Media Specialist, Central Pennsylvania Instructional Resource Center, Harrisburg, Pennsylvania

#### Teacher Evaluators

Mrs. Betty Dominguez, Infant-Preschool Teacher, New Mexico School for the Visually Handicapped, Albuquerque, New Mexico

Mrs. Rae Fellows, Vision Rehabilitation Specialist, Children's Hospital, Columbus, Ohio

Mrs. Suzie Kent, Preschool Teacher, Foundation for Junior Blind, Scottsdale, Arizona

Mrs. Mary Ann Lang, Early Childhood Coordinator, New York Association for the Blind, New York, New York

Ms. Julia Lanter, Program Supervisor, Redwood School, Ft. Mitchell, Kentucky

Ms. Mary Osbourne, Preschool Counselor, Indiana School for the Blind, Indianapolis, Indiana

Ms. Pauline Moor, Child Development Specialist, New York, New York

Mr. J. Wayne Noble, Parent-Advisor Program Coordinator, Utah School for the Blind, Ogden, Utah

Ms. Judy Peele, Program for Severely Handicapped Supervisor, South Metropolitan Association, Dolton, Illinois

Mrs. Mary Reid, Infant-Preschool Teacher, Oregon State School for the Blind, Salem, Oregon

Ms. Kris Sawyer, Teacher, Redwood School, Ft. Mitchell, Kentucky

Ms. Claire Sullivan, Teaching Supervisor, New York Association for the Blind, New York, New York

Mrs. Patricia Troisi, Infant-Preschool Teacher, Oregon State School for the Blind, Salem, Oregon

Ms. Linda Wnek, Social Worker, Cerebral Palsy Center, Children's Hospital, Cincinnati, Ohio

#### Parent Evaluators

Approximately 60 parents in the schools identified under "Teacher Evaluators" participated in evaluating the Home-Based Media materials. Parents completed an evaluation form and/or verbally critiqued the materials. Verbal evaluations were recorded by project staff.

#### Introduction to Map Study: The Globe

Mrs. Mary Nelle Council, Social Studies Teacher, Tennessee School for the Blind, Nashville, Tennessee

Dr. Jack Miller, Professor, George Peabody College for Teachers, Vanderbilt University, Nashville, Tennessee

Ms. Roberta Raithel, Social Studies Consultant, Texas Education Agency, Austin, Texas

#### Teacher Evaluators

Mr. Tom Anthony, Orientation and Mobility Instructor, Houston Independent School District, Houston, Texas

Ms. Catherine Carrigan, Elementary Teacher, Kaiser Elementary School, Houston, Texas

Miss Kathy Fitzsimmons, Vision Specialist, San Diego City Schools, San Diego, California

Ms. Debra Leff, Vision Teacher, Reilly Elementary School, Austin, Texas

Ms. Cyral Miller, Vision Teacher, Reilly Elementary School, Austin, Texas

Mrs. Alice Stabinsky, Vision Teacher, E. B. White Elementary School, New Orleans, Louisiana

Mrs. Bea Teal, Vision Teacher, Barrett School, Birmingham, Alabama

Mrs. Janie Tomlin, Elementary Teacher, Kaiser Elementary School, Houston,  
Texas

Miss Paula Watson, Harahan Elementary School, Harahan, Louisiana

Mrs. Larinda Wagenhauser, Vision Teacher, Kaiser Elementary School, Houston,  
Texas

Ms. Deborah Wise, Orientation and Mobility Instructor, Houston Independent  
School District, Houston, Texas

#### Light Box Materials: Level I

Mrs. Kay Ferrell, Senior Teaching Fellow, Department of Special Education,  
University of Pittsburgh, Pittsburgh, Pennsylvania

#### Teacher Evaluators

Mrs. Ellen Bernstein, Infant Specialist, Virginia Department for the Visually  
Handicapped, Richmond, Virginia

Mrs. Rebecca Brown, Teacher, Nina Harris Exceptional Student Education,  
Pinellas Park, Florida

Ms. Susan DeCaluwe, Supervisor of Multihandicapped Program, Meyer Children's  
Rehabilitation Institute, Omaha, Nebraska

Ms. Diana Laird, Teacher, Nina Harris Exceptional Student Education, Pinellas  
Park, Florida

Ms. Dejean Miller, Infant Teacher, Education Service Center, Region XV, San  
Angelo, Texas

#### Patterns Power Library

Miss Freda Henderson, Curriculum Director (Retired), Tennessee School for the  
Blind, Monkton, Maryland

Mrs. Alice Queenon, Teacher (Retired), Missouri School for the Blind, St.  
Louis, Missouri

Mrs. Deanna Yaeger, Teacher, Kentucky School for the Blind, Louisville,  
Kentucky



### Rehabilitation Needs Meeting

- Mr. Hank Baud, Vice-President, Adult Program, Alabama Institute for the Deaf and Blind, Talladega, Alabama
- Mr. Vito Giordano, Director, Rehabilitation/Education Services, The New York Association for the Blind, New York, New York
- Mr. Fred L. Gissoni, Director, Center for Independent Living, Louisville, Kentucky
- Mr. Paul F. Glatz, Superintendent, Michigan Rehabilitation Center for the Blind, Kalamazoo, Michigan
- Dr. Roseann B. Reid, Chairperson, Education Department, The Greater Pittsburg Guild for the Blind, Bridgeville, Pennsylvania
- Mrs. Ramona Sangalli, Coordinator, Educational Services, Arkansas Enterprises for the Blind, Little Rock, Arkansas
- Mr. W. D. Sims, Director, Rehabilitation Services, Tampa Lighthouse for the Blind, Tampa, Florida
- Mrs. Claudell Stocker, Coordinator, Communication Skills, Kansas Rehabilitation Center for the Blind, Topeka, Kansas
- Mr. Roy J. Ward, Deputy Commissioner for Special Services, Department for the Visually Handicapped, Richmond, Virginia

### Tangible Graphs

- Mr. Anthony Evancic, Educational Supervisor, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania
- Mrs. Dixie Howser, Mathematics Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Mrs. Karol Jump, Itinerant Teacher (Math, Social Studies, Science), Vista Unified School District; Vista, California
- Mrs. Stephanie Richards, Mathematics Teacher, Indiana School for the Blind, Indianapolis, Indiana
- Mr. Timothy Yerian, Itinerant Teacher (Social Studies, Science), Hamilton County Public Schools, Hamilton County, Ohio

Research and Developmental Personnel for FY 1981

|                       |                                |
|-----------------------|--------------------------------|
| Barth, John, PhD      | Research Scientist             |
| Bensinger, Sharon, BS | Research Assistant             |
| Berla', Edward, PhD   | Research Scientist (part time) |
| Bolin, Gene           | Library Clerk/Clerk Typist     |
| Caton, Hilda, EdD     | Research Scientist (part time) |
| Cundiff, Kerry, BA    | Editorial/Research Assistant   |
| Davis, Gary           | Mechanical Designer*           |
| Duckworth, Bill, MS   | Librarian/Research Scientist   |
| Franks, Frank, EdD    | Research Scientist             |
| Frere, Suzette, BA    | Research Assistant             |
| Glass, Robert, MEd    | Research Assistant             |
| Moore, Sheri, MS      | Research Scientist             |
| Morris, June, MA      | Director                       |
| Pester, Eleanor, MS   | Research Associate             |
| Poppe, Tom            | Model and Pattern Maker*       |
| Segovia, Mercia, PhD  | Research Assistant (special)   |
| Walsh, Jeannette      | Secretary                      |
| Willis, Deborah, BA   | Research Associate             |

\*Design and Development Section

Publications during FY 1982

- Berla', E. P. Tactile scanning and memory for a spatial display by blind students. Journal of Special Education, 1981, 15, 341-350.
- Berla', E. P. Haptic perception of tangible tactual displays. In W. Schiff & E. Foulke (Eds.), Tactual perception: A sourcebook. New York: Cambridge University Press, 1982.
- Franks, F. L. Metric measurement for blind students. In M. E. Corrick, Jr. (Ed.), Teaching handicapped students science: A resource handbook for K-12 teachers. Washington, D. C.: National Education Association of the United States, 1981.
- Franks, F. L., & Cozen, C. K. Introduction to map study I: An instructional program for teaching that a known environment can be represented abstractly. Louisville, Ky.: American Printing House for the Blind, 1981.
- Glass, B. Final report of materials needs meeting in rehabilitation of the blind. Louisville, Ky.: American Printing House for the Blind, April 1982.



Publications during FY 1982

PATTERNS, THE PRIMARY BRAILLE READING PROGRAM

First Reader Level:

American Printing House for the Blind. First reader level review worksheets to accompany new friends: Patterns, the primary braille reading program. Louisville, Ky.: Author, n.d. (student materials)

American Printing House for the Blind. First reader level worksheets to accompany new friends: Patterns, the primary braille reading program (3 vols.). Louisville, Ky.: Author, n.d. (student materials)

Caton, H., Pester, E., & Bradley, E. J. New friends, first reader level: Patterns, the primary braille reading program (3 vols.). Louisville, Ky.: American Printing House for the Blind, 1981. (student text)

Caton, H., Pester, E., & Bradley, E. J. Teacher's edition to accompany new friends, volumes 1, 2, and 3; first reader level: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1981.

Pester, E., & Modaresi, B. Teacher's manual review worksheets referenced to the first reader level new friends: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1981.

Rankin, E. F. Posttest, first reader level, criterion referenced to new friends: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, n.d. (student materials)

Rankin, E. F. Teacher's manual posttest criterion-referenced to the first reader level new friends: Patterns, the primary braille reading program. Louisville, Ky.: American Printing House for the Blind, 1981.

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DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES

FISCAL 1983

**American  
Printing House  
For The Blind  
Incorporated**

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Research and development activities during the year were focused again on the development of educational materials for use with persons who are visually handicapped. A wide array of product needs was addressed. These included products for early childhood and multihandicapped, low vision training, reading, mathematics, tactile graphics, and educational measures. The project summaries contained in this report reflect the process used in developing and evaluating new products as the ones described as being under development are at varying stages of the process. Throughout, the success of the American Printing House's research and development program is a tribute to the fine spirits of cooperation shown at all levels throughout the field. Financial support for the research program came from research and development funds included with the annual appropriation under the Act to Promote the Education of the Blind and from three grants. One, from the National Science Foundation, supported work on "Fundamental Mathematics Concepts for Physically Handicapped Students." Two separate grants from the Special Education Program of the U.S. Department of Education supported work on "The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers" for 8 months and on "A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children" for 4 months.

Research staff has continued to work closely with production personnel to expedite production of new products and to improve existing ones. Examples of the latter include the Seated Parquetry Set and the Paper Folding Jig. In both cases the Department's Design and Development staff redesigned the products and was instrumental in improving the process used for their production. This staff also is responsible for preparing production patterns and tooling for new products requiring such. New products resulting from the Department's efforts released during the year or scheduled for release early in FY 1984 include:

New Products Released during FY 1983

Continental Relief Map Cassette Program: Africa  
Continental Relief Map Cassette Program: Asia  
Continental Relief Map Cassette Program: Europe  
Introduction to Measurement in Mathematics  
Materials Carry-All  
Metric Measurement Program

*Patterns Library:* Preprimer  
*Patterns Library:* Primer  
*Patterns:* Second Reader Level  
30-cm Flexible Ruler  
*The World Book Year Book 1980 and 1981*, Recorded Edition

New Products To Be Released Early in FY 1984

Continental Relief Map Cassette Program: Australia  
Light Box  
Light Box Materials: Level I  
*Patterns:* Third Reader Level  
Stanford Achievement Test: Forms E and F

Three pervasive concerns will be addressed during FY 1984. One is the need to relate families of products to emphasize their programmatic structure and, therefore, recommended use. These will include braille readiness and training materials, low vision training materials, and map study training materials. Another is educational applications of microcomputers. Department personnel will set up a laboratory and be working actively in this area. And finally, the time has come for the American Printing House for the Blind to take a hard look at the direction of its research program in terms of today's economics, today's classrooms, and the kinds of information needed by educators today--and tomorrow.

Following are summaries of current and anticipated research and development activities.

## Early Childhood and Multihandicapped

### A Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Purpose: To develop a set of materials, targeted for professionals and parents, to assist in developing critical skills in visually impaired children, birth-24 months

Work completed during FY 1983. The Home-Based Media project contains three major components, all of which are designed to aid teachers, parents, and other professionals in developing critical skills in visually handicapped children, birth-24 months. The project components include a slide-cassette program, a 90-page manual, and an electronic sensory mat.

The slide-cassette program, "Playing the Crucial Role in Your Child's Development," was modified from the initial version after extensive formative evaluation. In revising the program, additional slides of minority and multi-handicapped children were included in the opening section. Also, slides depicting interactions with siblings and the father were added. Title slides were reshot to increase clarity, and the sound track was revised and recorded with a professional reader. Numerous attempts at obtaining permission to use recorded music were unsuccessful. Thus, original music was obtained and recorded. When all revisions were finalized, the entire slide-cassette program was translated into Spanish. Simultaneously, a Parent Discussion form was developed to assist parent viewers in applying information in the program to their child. The Parent Discussion form was also translated into Spanish. Separate evaluation forms for parents and teachers were developed. Field evaluation sites were identified and contacted as to their interest in evaluating the slide-cassette program. Cooperating sites included home-based and center-based program models. Evaluating teachers included public school, residential school, and private agency personnel. The revised slide-cassette program, and accompanying Parent Discussion forms, were circulated to more than 35 programs for evaluation by both parents and teachers. Evaluation questions included content areas to further emphasize or deemphasize; attitudes/content tone portrayed; the quality of the presentation, including narrator's voice, photography, and background music; organization of the presentation; and overall opinion and helpfulness of the slide-cassette program. A data compilation system was designed and initiated. As received, data were posted and checked.

The manual was developed from a detailed outline included in the initial formative evaluation materials. The manual details information to parents and teachers of birth-24 month children on such subjects as scheduling, understanding of visual impairment, sensory stimulation activities, medical concerns, choosing an educational program, and so on. Suggestions of household items and play activities are also given, as well as a listing of helpful books and publications. The manual has been greatly expanded and enhanced from the formative detailed outline; the revised manual is divided into 12 sections and contains some 90 pages. An evaluation process was developed for parents and teachers field testing the manual, and appropriate questionnaires were designed. Some 75 programs, including parents and professionals,



evaluated the manual in the field evaluation process. Evaluation issues included the following: general theme and tone; information to be added/deleted; format; topic arrangement; writing style and so on. In addition, each evaluator was asked to write suggestions for improvement on each page of the manual. A system for compiling the manual data was developed. Data were posted and checked as received from field evaluators/reviewers.

The sensory mat is an electronically activated device which, when a child placed upon it makes movements, rewards him with pleasant tones or chords. Based on initial field evaluation data, substantial modifications were made to the mat prior to final field evaluation. The mat was redesigned to provide a battery operated power source. In addition, a timed circuit breaker was installed, allowing an intermittent sound function as well as a tone-hold function. Also, a textured cloth overlay was designed and developed. After preliminary testing with one revised mat, two additional mats were made. At this juncture, the electronic design was committed to printed circuit boards, allowing less labor intensive assembly, resulting in ultimate cost savings to the consumer. Activities detailing suggested uses of the mat to develop motor and mobility skills were developed. Programs, both for young and multihandicapped visually impaired children, were contacted for possible participation in field evaluation. The research design called for both short-term and long-term evaluation sites. Evaluation sites were identified; simultaneously, an evaluative form was developed to be completed by cooperating teachers. Questions addressed durability, safety, relative interest of the item to students, skills developed using the mat, reliability, design considerations, as well as child data information. An additional component of the evaluation design involved the selection of three students for pre and post videotaping with the electronic mat materials. The Home-Based Media project was funded through a grant from the Special Education Program, U.S. Department of Education through October 1982. Since November 1982, Research and Development departmental monies have funded the Home-Based Media project.

Work planned for FY 1984. After remaining evaluative data on all three project components are in, posted, and checked, the data will be analyzed. Revisions will be determined for each of the three project components. Design, content, and other revisions will be designed and initiated. Upon completion of all revisions, each item will go through a final expert review. Thereafter, necessary documentation and specifications will be formulated for production preparation. A final report will be written, detailing total project development. A financial report, reflecting total project development will also be prepared. Sheri Moore directed the project, assisted by Sharon Bensinger, Kerry Cundiff, and Suzette Frere.

#### Materials for Multihandicapped Visually Impaired Students--Needs Assessment Meeting

Purpose: To determine needed educational aids and related materials for multihandicapped visually impaired students

Work completed during FY 1983. A needs assessment meeting was conducted in January 1983 which included American Printing House consumers familiar with the needs of the multihandicapped visually impaired population. The previous

assessment meeting for determining educational materials needs for multihandicapped visually impaired students was held 5 years ago during FY 1978. Research staff members have systematically developed the materials prioritized.

The 1983 needs assessment meeting consultants identified 13 needed educational materials. These materials can be grouped into four basic categories: sensory, prevocational, life skills and self-help, and leisure time/miscellaneous.

Of the 13 recommendations, the materials were prioritized by the consultants for research and development as follows:

1. "Peel and Feel"--adhesive backed sheets of varied odors and textures used for tactual discrimination exercises and personal identification
2. "Adolescent" Sensory Stimulation Kit
3. Expanded Prevocational Skills Development Materials
4. Survival skills awareness and development
5. Daily living skills kit
6. Life skills cassette program
7. Infant packet
8. Vocational skills index adaptation

Sheri Moore was assisted by Sharon Bensinger and Suzette Frere in organizing the needs assessment meeting.

Work planned for FY 1984. During this year, the needs assessment meeting recommendations will be considered in light of Printing House resources, available staff, and developmental feasibility. Following this review, the educational materials recommendations will be prioritized for development, and the first such projects will be initiated. Sheri Moore will serve as project leader.

#### Low Vision

#### Bright Sights (Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students, birth-36 months)

Purpose: To develop a set of materials including fluorescent items used in a black light environment to develop visual skills in students functioning at a birth-36 month level

Work completed during FY 1983. The Bright Sights materials were formally turned over to the Manufacturing Division while support design and tooling was underway. The materials have undergone a final professional expert review. Complete specifications for all items and component parts were written and circulated to appropriate manufacturing personnel.

Work planned for FY 1984. Bright Sights project staff will continue to assist manufacturing personnel, as requested, with the production of these materials. The first production set of Bright Sights will be submitted to U.S. Testing Laboratories in Hoboken, New Jersey, for safety evaluation. Sheri Moore has coordinated this phase of the project.

#### Light Box and Light Box Materials: Level I

Purposes: To develop (a) a Light Box and (b) a set of materials and related activities to use with the Light Box to facilitate the development of residual vision in children functioning from birth-4 years of age

Work completed during FY 1983. The Light Box and its related materials have been approved for production. Subsequently, the Light Box was modified slightly as indicated in its field evaluation and a new pattern (mold) for it completed. Being an electrical appliance, a model was sent to Underwriters Laboratory for approval. After receiving approval, production tooling was completed. (Production tooling for the Level I materials was completed during FY 1982.) Tom Poppe and Gary Davis were responsible for readying these products for production.

#### Light Box Materials: Level II

Purpose: To develop a set of materials and related activities to use with the Light Box to facilitate the development of residual vision in children functioning from 3-5 years of age

Work completed during FY 1983. Ideas for the Level II materials were gathered from a questionnaire mailed to preschool and first grade teachers, from project staff, and from evaluators of the Level I materials. Rough prototypes and examples of proposed materials were gathered and presented in September 1982 to a consultant familiar with the Level I materials. The consultant approved most of the proposed materials and suggested numerous others to train the residual vision of students functioning from 3-6 years of age.

Following the consultation, all suggestions for materials were reviewed. Ideas for items which were available commercially or were not feasible to produce were discarded. Preliminary work began outlining specifications for each of the remaining items; sketches were made of a variety of shape and picture matching tasks and games.

The large number of materials in the proposed set of materials, however, made it advisable to reduce its contents. As discarding items would result in the slighting of important skills, a decision was made to divide the proposed materials into two smaller, overlapping kits. The first, for children functioning from 3-5 years of age, would follow the Level I materials and was designated Level II. The next, designated Level III, would include materials for students functioning from 4-6 years of age. Development of Level III items will be completed subsequently.



A meeting with a second consultant was arranged in December to determine which skills should be addressed by Levels II and III, the sequence in which skills should be placed within each, and, therefore, materials to be included in each set. In January the proposed Level II and Level III materials and skill sequences were presented to four project consultants for critique. With a few minor alterations, the proposed division of materials and skills was approved.

Prototypes of the Level II materials were constructed and activities drafted based upon the skill sequence developed for Level II. These materials were sent out for formative evaluation to four teachers who used them for 4-6 weeks with 17 students functioning from 3-5 years of age. The materials included a pegboard and pegs, a template and tiles, parquetry pieces, colored shape cards, templates, familiar object stencils, familiar object pictures, sticks, a black-out background, and large acetate overlays.

In general, the materials were well-received by students with 60% of them asking, of their own initiative, to work with the materials. Teachers reported 70% of their students attend longer to tasks performed with the Light Box than to similar tasks performed without the Light Box.

Indicated revisions were made to the materials and six sets of prototypes prepared for field evaluation. An 80-page booklet of prewriting, matching, and part/whole worksheets was also prepared and Activity Sheets were designed intended as masters which teachers can duplicate on acetate and use with the Light Box.

Work planned for FY 1984. The field evaluation of the Level II materials will be conducted during the fall. It will include both teacher critiques and student use data. This information and data will be used to make final revisions. In readying this set of materials for production, written specifications for all components will be developed and production tooling completed. The project is directed by Suzette Frere.

#### Light Box Materials: Level III

Purpose: To develop a set of materials and related activities to use with the Light Box to facilitate the development of residual vision in children functioning from 4-6 years of age

Work planned for FY 1984. The initial task of identifying materials that will make up this level was done in the development of the Level II materials as described in that section. Further development and evaluation of the Level III materials and activities will follow the same procedure as that used for the Level II materials. Suzette Frere will be responsible for the development of these materials.

### Developing Vision through Lights

Purpose: To develop a set of light-related materials useful in stimulating and developing remaining vision in multihandicapped visually impaired students

Work completed during FY 1983. Several teacher evaluators of the Bright Sights project pointed out the need for additional materials for use with multihandicapped students to develop remaining vision. Thus, a collection of 17 light-related devices was gathered and presented in May 1983 to the Educational Research and Development Committee of ex officio trustees. The committee was queried as to the desirability and feasibility of such a set of light related items. Their positive recommendations encouraged Printing House staff to proceed with the project.

Work planned for FY 1984. Of the 17 light related items, 12 will be selected for inclusion in formative evaluation. Several of these items will be adapted or modified prior to the formative testing. Of the 12 selected items, 3 of each will be purchased. Potential field evaluation sites and cooperating teachers will be identified. Evaluation forms, including both teacher evaluative data and child data, will be developed. Guidelines for use of the materials and activities will be developed with the assistance of cooperating teachers. Following the formative evaluation, all data will be posted, compiled, analyzed, and revisions will be determined. Following revisions to all project materials, a formal field evaluation will be conducted. Child data will be collected along with teacher evaluation data. Sheri Moore will direct the project, assisted by Sharon Bensinger.

### Reading

#### Patterns: The Primary Braille Reading Program (Beginning Braille Reading Series)

Purpose: To develop a set of beginning reading materials specifically designed to minimize problems encountered by the beginning braille reader

Work completed during FY 1983. Work on *Patterns: The Primary Braille Reading Series* has been completed this year. Field testing was completed when the last six students involved were given the Third Reader Experimental Test Item Pool and the Metropolitan Reading Achievement Test. All Third Reader materials were revised based on evaluations and the results of the field testing and prepared for production. The Third Reader Level is scheduled for sale at the beginning of the 1983-84 school year. Data from the production posttests Readiness through Second Reader Levels have continued to come in, and the data for the Readiness Level have been analyzed with good results.

Work planned for FY 1984. Data from the production posttests Preprimer through Third Reader Levels will continue to be solicited and will be analyzed as soon as a sufficient number of results for each level become available. Applications for copyrights for the Second and Third Reader Level *Patterns* materials will be submitted.

Hilda Caton and Eleanor Pester are responsible for this project with Eddy Jo Bradley serving as directing editor. Gene Bolin and Jeannette Walsh have assisted with this project. Nancy Pitt has worked closely with the research department to prepare the special braille plates required for the project.

### Patterns Library Series (Patterns Power Library)

Purpose: To develop sets of braille books which succeed the levels of *Patterns: The Primary Braille Reading Program* from Preprimer through Third Reader and which provide a means of practicing reading and discovering that reading can be fun

Work completed during FY 1983. Although slower than projected last year, work on the *Patterns Library Series* progressed. The Preprimer Level materials became available in November and sold well. The outside review of the Primer Level was completed, revisions were made, including the elimination of one of the books based on the reviews, and the 27 remaining books and the accompanying *Notes for Teachers* were prepared for production. This level went on sale in June. Twenty-three books were selected or written for the First Reader Level of the library series. Also, the accompanying *Notes for Teachers* were written. All of these materials have now been reviewed, revised based on the reviews, and prepared for production. Many books for the Second and Third Reader Levels have been selected and are being edited.

Work planned for FY 1984. Work on the *Patterns Library Series* will be completed this year. Selections for the Second and Third Reader Levels of the library series will be finalized and edited and the *Notes for Teachers* for these levels will be prepared. Then the materials will be sent out for review, revised, and prepared for production.

Eleanor Pester is responsible for this project. She is assisted by Eddy Jo Bradley. John Barth and Suzette Frere helped with illustrations.

### Read Again: A Braille Program for Recently Blinded Persons

Purpose: To develop a set of materials designed to teach braille to persons who have lost their vision after initially learning to read using print

Work completed during FY 1983. Work on this project was initiated during 1983. The initial steps included visits to agencies responsible for teaching adult blind persons. These agencies included the Alabama Institute for the Deaf and Blind, the New York Association for the Blind, the Hadley School for the Blind, and the Chicago Lighthouse for the Blind. The purpose of these meetings was to identify specific needs for reading materials by the target population and to identify persons who might serve as consultants to the project.



Work planned for FY 1984. The next steps include the formation of the consulting committee and the initial meeting of the committee. The committee will meet at the American Printing House for the Blind on July 15-16, 1983, to make recommendations regarding the content and format of the program materials.

During FY 1984 a detailed set of specifications for the program will be written, reviewed by the committee, and revised. Once the specifications are complete, the writing of the program materials will begin. Tentative plans are to complete the writing of all four levels of the program during FY 1984.

Hilda Caton is responsible for this project. She will be assisted by Eleanor Pester. Eddy Jo Bradley will be the directing editor.

## Mathematics

### Fundamental Mathematics Concepts for Physically Handicapped Students

Purpose: To develop a curriculum-based diagnostic and prescriptive program targeting concepts critical to understanding basic mathematics to facilitate mathematics instruction of young blind students and to remediate deficiencies of older blind students

Work completed during FY 1983. Program materials developed during FY 1982 were subjected to a field evaluation. Participating were 30 teachers of more than 100 academic blind, legally blind deaf/blind, and multihandicapped blind students in 10 states. The evaluation was a teacher critique based on student performance. Because of the lack of appropriate evaluative instruments to measure acquisition of low level mathematics concepts and the concerns for how blind students learn concepts and how well they could use the program materials, the evaluation emphasized in-depth work with a limited number of students. Teacher evaluators represented both day and residential programs. Critiques from teachers of academic blind students and from content experts (mathematicians) provided information from which revisions were made to the instructional materials for use by academic blind students.

Work planned for FY 1984. The field evaluation of the program materials being used by deaf/blind and multihandicapped blind students will be completed. Following this, needed revisions will be made. The intent is to have three sets of parallel teacher materials for use with academic blind, deaf/blind, and multihandicapped blind students at this level--knowledge and skills required of students in order to begin mathematics study. Tangible student materials will be the same for the three groups.

This project is funded by the National Science Foundation. The funding will enable workshops to be held during FY 1984 to instruct teachers in use of the program. Workshops will be conducted in conjunction with regional and national meetings. Frank Franks is the project director. He is assisted by Bob Glass.

## Social Studies

### Introduction to Map Study: The Globe

Purpose: To develop a set of materials to introduce basic concepts underlying map and globe study and to relate the two

Work completed during FY 1983. The field evaluation of this program was completed during FY 1982. Subsequently, the materials were revised as indicated. The program was approved for production at the May 1983 meeting of the American Printing House's Educational Research and Development Committee. The instructional materials include a student activities guidebook, a 12-inch geophysical globe mounted on a stand, and two small globes. The guidebook contains information for the teacher, student activities, and a Globe Concept and Skill Analysis test for administration to the student upon completion of the program. A Simplified Continental Relief Map of North America is an essential component of the program. Use of numerous concrete objects and materials from the environment are suggested in the activities. Frank Franks and Bob Glass were responsible for the development of this program.

## Tactile Graphics

### Incised Grid Study

Purpose: To compare the readability of tactile graphic displays made in paper featuring raised vs. incised grids and having raised linear and point symbols

Work completed during FY 1983. Previous research has found that the presence of raised areal patterns in a tangible graphic display adversely affects display reading performance. Specifically, they decrease the accuracy with which the display is read and increase the time required. It was conjectured that a reduction in the tactual noise created by the raised areal background patterns might be achieved by employing incised rather than raised elements in the composition of such areal patterns. To test this hypothesis, a study was conducted using 24 braille readers in grades 4-7. Significant findings were that line tracking tasks required less time and resulted in fewer errors (line departures) in the incised grid condition than in the raised grid condition and that tasks involving point location required less time in the incised grid condition. Implications for this finding relate to the design of graphics. An immediate result of the finding was that the new Plate Embossing System for Tactile Graphics being developed at the American Printing House was designed to produce both raised and incised areal patterns. John Barth was responsible for this study.

### The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers

Purpose: To develop a program to teach blind students graph reading skills

Work completed during FY 1983. The final phase of this project involved an evaluation of the efficacy of the instructional program by having students and teachers use it. The program package used in the field evaluation included the following items: (a) student's copy of the program in Grade 2 literary braille, (b) Teacher's Guide--a complete print version of the program, interspersed with additional graph reading information, (c) materials for graph construction by students, (d) multiple-choice test for assessing a student's mastery of graph skills, concepts, and operations, and (e) teacher questionnaire which addressed all areas of the program's design and content.

Ten areas in North America were involved in the field evaluation: Arkansas, California, Connecticut, Florida, Illinois, Missouri, North Carolina, Utah, Washington, and Ontario, Canada. Of the 35 teachers involved in the study, 13 were from residential school programs and 22 from public school, itinerant programs. In all, 60 braille reading students participated. Half of these students were from grades 5-7, half from grades 8-10. In each of these grade groupings, 60% were enrolled in residential schools for the blind, 40% in public school programs.

All students were administered a 64 item, multiple-choice graph test at the beginning and end of the evaluation period, the average length of which was approximately 10 weeks. During the interim between the two test sessions, 30 of the students received instruction in the graph program. The other 30 students were given no graph instruction during this time, thus serving as a control against which to determine the effects of the instructional program. Teachers in the experimental group critiqued the program by (a) recording their observations in the Teacher's Guide as they progressed through the program and (b) filling out an evaluation questionnaire at the conclusion of the instructional period.

Statistical analyses of the field evaluation data revealed that substantial gains in graph reading skills and concepts were realized by the students receiving instruction, relative to both their own pretest scores and to the scores obtained by their counterparts in the control group.

The control group of students received a mean score of 58% on the pretest and 58% on the posttest, for no gain. In contrast, the experimental group of students received mean scores of 56% and 84%, for an average gain of 28% from pretest to posttest. However, if only those questions are considered which deal specifically with graph reading skills and concepts, rather than ones involved with more general display reading skills and concepts, the gain in experimental group scores increases to 37% (pretest: 43%; posttest: 80%). On the test as a whole, the experimental students in grades 5-7 improved to a greater extent than those in grades 8-10 (32% versus 23%). This outcome was probably due to the fact that the students in grades 8-10 began the study with considerably more graph reading knowledge than those in grades 5-7 (64% as compared to 48%). Overall, the students in grades 5-7 had more room in which to improve.

Subjective feedback obtained from the teachers by means of the evaluation questionnaire was quite positive. For example, 88% of the teachers felt that the program was interesting to their students, 98% thought that it covered all



of the fundamental graph skills and concepts, and 95% felt that its sequential development of these skills and concepts followed a logical progression of thought. No major changes in the program's design or content were suggested. In general, the teachers were enthusiastic about the prospect of having a packaged set of instructional materials in this subject area.

Work planned for FY 1984. The results of the data analyses, together with information obtained from the questionnaire and teachers' critiques, will be used to compose a final version of the instructional program. Additionally, a final report of the project will be prepared. John Barth was the project director. He was assisted by Edward Berla', Debbie Willis, and Jeannette Walsh. The project was funded through February 1983 by a grant from the Special Education Program, U.S. Department of Education.

### Plate Embossing System for Tactile Graphics

Purpose: To develop a mechanical system to upgrade the quality of tactile graphic displays produced at the American Printing House in a paper medium

Work completed during FY 1983. Construction of the system's primary embossing machine was completed. This machine is the most complex component of the system and will produce linear symbols and areal patterns. The punch and die sets used to emboss these were subsequently completed. The symbols represent an improvement in terms of symbol variety, symbol quality, symbol consistency, and ease of production.

Work planned for FY 1984. The full system is expected to become operational during FY 1984. Two activities remain to be completed. First, a second, simpler embossing machine with accompanying punch and die sets will be constructed. The function of this companion machine will be to emboss point symbols. Second, legibility testing of all three symbol sets (linear, areal, and point) will be undertaken to identify highly legible sets of symbols from each class. This information will be used in determining those to be included in the working system and in establishing design specifications for tactile graphics. Gary Davis and John Barth are responsible for this project.



## Educational Measures

### Stanford Achievement Test: 1982 Edition

Purpose: To prepare braille and large type editions of this test series along with the necessary special directions for their administration and appropriate norms

Work completed during FY 1983. Preparation of copy for these materials was completed and given to the Editorial Department for printing. Work was delayed because of a delay in getting necessary materials from the test publisher, Psychological Corporation. Bill Duckworth was responsible for the adaptation of this test series. He was assisted by Kerry Cundiff, Debbie Willis, and Jeannette Walsh.

### Diagnostic Test of Grade 2 Literary Braille

Purpose: To develop a diagnostic test of the literary braille code

Work completed during FY 1983. Work continued on the development of this test. An item pool was developed for the nine subtests and given to 52 students, grades 4-12. These data provided information for the selection of items for an experimental edition.

Work planned for FY 1984. During the field evaluation phase of the project, the experimental edition of the Diagnostic Test of Grade 2 Literary Braille will be given to a minimum of 150 braille reading day school and residential students, grades 3-12. After all data are evaluated, a test manual will be prepared describing the test's rationale, development, technical characteristics, administration, and interpretation.

In addition to the diagnostic test, an adapted rate-of-reading test will be administered. This test is being considered for inclusion in the diagnostic package. The third component being considered for inclusion is an observational checklist of braille reading characteristics. This checklist will be sent to experienced teachers of braille for their use and evaluation. Bill Duckworth and Hilda Caton are responsible for this project. They are assisted by Sharon Bensinger. Earl Rankin, a test specialist and project consultant, is responsible for preparing the test manual.

### Battery of Performance Tests

Purpose: To develop a battery of cognitive and perceptual subtests to serve as tactile analogues or counterparts to the Wechsler Performance Scales

Work completed during FY 1983. This battery of tests called the Tactile Assessment of Performance, is being developed by Joan Chase of Rutgers Medical School. Members of the research staff are consulting with her to assure that if a viable product results, it will be in a form appropriate for production and distribution by the American Printing House for the Blind.

Using a small grant awarded by Rutgers, Dr. Chase collected limited data on the prototypical test materials during the summer of 1982. Results looked promising. Subsequently, she and June Morris met with David Herman, A Senior Project Director in the Measurement Division of Psychological Corporation, regarding future development of the test battery. Dr. Herman, who worked directly with David Wechsler in the development of several of the Wechsler scales, has agreed to participate in the project as a technical consultant. He has provided information needed for future project planning. In April 1983 project consultants met with Joan Chase and June Morris to review work done to date and to provide input for future development of the test battery. Outside support is being sought by Dr. Chase who directs the project.

#### Educational Measures Needs Meeting

Purpose: To examine needs for educational measures for visually handicapped students

A meeting was held on April 19 and 20, 1983, with five outside guest consultants and two of the American Printing House staff. Prior to the meeting major test publishers were queried for the identification of those tests most widely used nationally. All guest consultants were asked to determine tests thought to be adaptable and which they felt reflected a need in the area. Other sources for obtaining information were an appeal for the identification of test needs in *APH Notes* and a canvas of those attending the National Association of School Psychologist's annual meeting. Those ideas submitted in these surveys were studied by the consultants during the meeting and became a part of the discussion for test needs.

From the discussion and investigation, five need areas were identified and prioritized. They are needs for:

1. A preschool developmental scale
2. An individually administered achievement test that does not utilize multiple-choice format
3. Prevocational and career education diagnostic instruments
4. Instruments for the diagnosis of learning disabilities, especially reading disabilities
5. An instrument for the evaluation of mechanical aptitude

Even if a tactile test of mechanical aptitude is impossible, a large type adaptation is needed. While this ties in with prevocational needs, it will be a separate area of investigation.

In addition to reviewing test needs, some mechanics of test adaptation and use were considered. These included how money pictured in the print edition of a test should be handled in the braille and large type editions, how maps and other graphics should be handled in braille editions, use of electronic calculators in mathematics tests, and use of both braille and large type answer sheets. Bill Duckworth was responsible for this needs assessment.



## Other Research

### Academic Achievement of Legally Blind Students

Purposes: (a) To determine if legally blind students in grades 2-6 are performing academically at grade level and (b) to identify specific concept areas in mathematics where deficiencies exist

Work completed during FY 1983. The following summary relates some of the results of this study. The data are based on the scores of 369 legally blind students; 280 (76%) from residential schools, 89 (24%) from public schools; 241 (65%) large type readers, 128 (35%) braille readers.

The purpose of this study was twofold. The primary objective was to determine if legally blind students in grades 2-6 were performing academically at grade level as measured by the Stanford Achievement Test, Form A or B. In order to measure whether blind students were functioning academically at grade level, grade deviations on all subtests were calculated and a mean grade deviation determined.

Grade deviation was defined as the difference between the grade equivalent scored on a particular subtest and the actual assigned grade of the student. A grade deviation in the minus direction indicated that the students who took that subtest scored below their actual grade placement while a plus indicated that the students, on the average, scored above their grade placement.

The grade deviations on all three math subtests, for both braille and large type readers, were in the minus direction. And, in all but three instances, the braille readers scored much more poorly than the large type readers.

The scores were also quite poor and all in the minus direction for social science and science. These scores were not available for braille readers who had taken Primary Battery Level II since these subtests were omitted at this level.

On three subtests, the braille readers scored better than the large type readers, except for Primary Battery Level II. These subtests were Vocabulary, Word Study Skills, and Spelling.

The three subtests on which the scores were generally the best overall, as indicated by scores in the plus direction, were Reading Comprehension, Listening Comprehension, and Language. This was only true for the two upper levels, Intermediate Battery Level I and Intermediate Battery Level II.

Legally blind students were approximately 1 1/2 years older than sighted students in the same grade taking the same test.

The second objective was to determine specific concept areas in mathematics where deficiencies exist. The objective was accomplished by an item analysis on the three math subtests of the Stanford Achievement Tests, Form A or B, where all the individual item responses were still available. The individual item responses were available for 224 of the 369 students.

The scores for each math item were calculated by finding the percentage of students answering the item correctly minus the item difficulty value (percentage of pupils on whom the test was normed answering each item correctly) which then equalled the difference score. If the difference score was a plus score, then the legally blind students had performed better than the norm on that particular item. If the score was in the minus direction, then the legally blind students had performed more poorly than the national group on whom the test was normed.

An item was considered extremely difficult if the percentage of legally blind students answering the item correctly minus the item difficulty value equalled -25% or more.

The -25% difference score was selected somewhat arbitrarily in determining which items would be considered extremely difficult and therefore posing special problems for blind students. Because of the small n, particularly for the braille readers, it was decided to select a large enough difference score so that only true problem items would be pinpointed for further examination. It was decided that a difference score of -25% would allow little or no room for chance fluctuations in the test scores.

The braille readers had pervasive problems. Their performance was much poorer than large type users. The poorest performance for braille readers was on mathematics concepts with 27% of the items in the extremely difficult category. The overall performance on computation and applications was the same; 19% of the items were extremely difficult.

The large type users had no major problems. Although mathematics applications seemed to pose much more of a problem for these students than did the areas of concepts or computation.

The extremely difficult items have been identified. They will be reviewed and categorized as to specific concepts tested. Those concepts posing particular problems for blind students will be incorporated into the fundamental math program presently under development at the American Printing House. This study was conducted by Debbie Willis.

Work planned for FY 1984. A final report has been written. It will be summarized and submitted for publication.

#### The World Book Year Book 1982 and 1983, Recorded Edition

Purpose: To produce a combined edition of the World Book Year Books for 1982 and 1983 in recorded form

Work completed during FY 1983. In May 1983 plans were finalized with World Book--Childcraft International for producing a combined 1982-1983 Year Book to accompany The World Book Encyclopedia, Recorded Edition. It is anticipated that a combined Year Book will be produced every other year until an entire new edition of the encyclopedia is deemed necessary.

The materials and format to be used in this 1982-1983 edition remained the same as in the previous edition. The material included came from the Chronology and Year on File sections of both the 1982 and 1983 Year Books. Some selected articles from the Supplemental sections were also recorded. These Year Books cover the events of 1981 and 1982.

Specifications for both editing and indexing the combined Year Book were decided upon and work began in late May. The American Printing House staff members from various departments--large type, braille, recording, tape duplication, business, etc.--held progress meetings periodically.

The completed Year Book is contained in one volume which includes the braille and large type indexes and 12 cassettes. Sharon Bensinger was assisted by Debbie Willis on this project.

### Microcomputer Applications

The growing use of microcomputers in the classroom for a multitude of educational purposes has made it imperative that efforts be taken to insure that visually handicapped students are not shut off from the educational opportunities afforded by this new technology. Exactly what the American Printing House's role should be in this rapidly changing field is not entirely clear at this time. However, the Printing House is interested in making major contributions in this field and is actively exploring the feasibility of several areas of involvement.

Currently, there is no central source responsible for monitoring the development of microcomputers, peripheral devices, software, and related materials with respect to their application to the educational needs of visually handicapped students. Neither is there a means for disseminating such information. It is conceivable that the American Printing House could assume these responsibilities. Other possibilities for involvement in this area include the production and distribution of computer related materials in the form of braille, large type, and recordings. Such materials might include books on computer literacy, hardware related user manuals, and programming texts. Especially adapted or created software represents yet another possibility. All of these activities have been addressed in a grant proposal recently submitted by the American Printing House to the U.S. Department of Education. Finally, in anticipation of work in this area, a microcomputer laboratory (including special peripherals for access by visually handicapped persons) is being set up in the Department of Educational Research. John Barth and Debbie Willis will be responsible for projects in this area.



Agencies Participating in Research during FY 1983

Alabama Institute for the Deaf and Blind; Talladega, Alabama  
Alaska Blind-Visually Impaired Program; Anchorage, Alaska  
Alaska Treatment Center; Anchorage, Alaska  
Arizona State School for the Deaf and Blind; Tuscon, Arizona  
Atlanta Area School for the Deaf; Clarkston, Georgia  
Atlanta Area Services for the Blind; Atlanta, Georgia  
Auburn University Deaf-Blind Project; Auburn University, Alabama  
Barrett Elementary School; Birmingham, Alabama  
Boston Center for Blind Children; Boston, Massachusetts  
Cardinal Hill Hospital; Lexington, Kentucky  
Center for Blind Children; Milwaukee, Wisconsin  
Chicago Lighthouse for the Blind; Chicago, Illinois  
Chicago Public Schools; Chicago, Illinois  
Child Study Center; Oklahoma City, Oklahoma  
Children's Hospital Eye Center; Columbus, Ohio  
Children's Special Education Center; Kansas City, Missouri  
Chula Vista School District; Chula Vista, California  
Columbia Lighthouse; Washington, D.C.  
Connecticut Services for the Blind; Wethersfield, Connecticut  
Dallas Independent School District; Dallas, Texas  
Dallas Services for the Visually Impaired; Dallas, Texas  
DeKalb County Schools; Scotsdale, Georgia  
Delta Gamma Foundation; St. Louis, Missouri  
District of Columbia Vision Programs; Washington, D.C.  
Einstein School; Hanover Park, Illinois  
Fairmont School; El Cerrito, California  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
Foundation for Blind Children, Scottsdale, Arizona  
Georgia Academy for the Blind, Macon, Georgia  
Greater Pittsburgh Guild for the Blind, Bridgeville, Pennsylvania  
Hadley School for the Blind, Winnetka, Illinois  
Hillsborough Public Schools; Tampa, Florida  
Idaho State School for the Deaf and Blind; Gooding, Idaho  
Illinois School for the Visually Impaired; Jacksonville, Illinois  
Indiana School for the Blind; Indianapolis, Indiana  
Iowa Braille and Sight Saving School; Vinton, Iowa  
Jefferson Parrish Schools; Harahan, Louisiana  
John Tracy Clinic; Los Angeles, California  
Kaiser Elementary School; Houston, Texas  
Kentucky School for the Blind; Louisville, Kentucky  
Keystone AEA; Dubuque, Iowa  
Lancaster-Lebanon Intermediate Unit 13; East Petersburg, Pennsylvania  
Laurel Ridge Elementary School; Decatur, Georgia  
Lighthouse of Houston; Houston, Texas  
Marshall School; Castro Valley, California  
Maryland School for the Blind; Baltimore, Maryland  
Maryland School for the Blind, Outreach Program; Eastern Shore, Maryland  
Miami Public Schools; Miami, Florida  
Missouri School for the Blind; St. Louis, Missouri  
Montgomery County Schools; Bethesda, Maryland

New Mexico Infant/Preschool Program; Sante Fe, New Mexico  
New Mexico Preschool for the Visually Handicapped; Albuquerque, New Mexico  
New Mexico School for the Visually Handicapped; Albuquerque Office, New Mexico  
New York Association for the Blind; New York, New York  
New York Institute for the Blind; Bronx, New York  
Office for the Blind and Visually Impaired; Little Rock, Arkansas  
Ohio Bureau for the Visually Impaired; Cincinnati, Ohio  
Omaha Public Schools; Omaha, Nebraska  
Oregon State School for the Blind; Salem, Oregon  
Orleans Parrish Schools; New Orleans, Louisiana  
Perkins School for the Blind; Watertown, Massachusetts  
Project DART Allegheny County; Pittsburgh, Pennsylvania  
Regional Education Service Center; Beaumont, Texas  
Reilly Elementary School; Austin, Texas  
South Carolina Commission for the Blind; Charlestown, South Carolina  
South-West Regional School for the Deaf and the Blind; Mobile, Alabama  
State Department of Education, Division of Blind Services; Tampa, Florida  
State Department of Education, Division for Visually Impaired; Wilmington,  
Delaware  
Tennessee School for the Blind, Nashville, Tennessee  
Tulsa Little Lighthouse; Tulsa, Oklahoma  
United Cerebral Palsy Center; Denver, Colorado  
Variety Club for Blind Babies; San Francisco, California  
VIFTY House, Western Pennsylvania School for Blind Children; Pittsburgh,  
Pennsylvania  
Vista Unified School District; Vista, California  
Western Pennsylvania School for Blind Children; Pittsburgh, Pennsylvania  
Wheeling Society for Crippled Children; Wheeling, West Virginia  
Wichita Council for Preschool Children; Wichita, Kansas  
Wisconsin School for the Visually Handicapped; Janesville, Wisconsin

Consultants during FY 1983

Beginning Braille Reading Series

..

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago,  
Chicago, Illinois

Dr. Earl F. Rankin, Professor, Department of Curriculum and Instruction,  
University of Kentucky, Lexington, Kentucky

Teacher Evaluators:

Ms. Donna Bergstrom, Resource Room Teacher, Einstein School, Hanover Park,  
Illinois

Mrs. Helen Berry, Classroom Teacher, Missouri School for the Blind, St.  
Louis, Missouri

Mrs. Dorothy Ferry, Classroom Teacher, Illinois School for the Visually  
Impaired, Jacksonville, Illinois

Diagnostic Test of Grade 2 Literary Braille

Mrs. Sarah Ashman, Psychologist, Indiana School for the Blind, Indianapolis,  
Indiana

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago,  
Chicago, Illinois

Mrs. Freda Henderson, Curriculum Director (Retired), Tennessee School for the  
Blind, Nashville, Tennessee

Dr. Earl Rankin, Professor, Department of Curriculum and Instruction, Univer-  
sity of Kentucky, Lexington, Kentucky

Educational Measures

Mr. Don Adamshick, Psychologist, Ohio State School for the Blind, Columbus,  
Ohio

Mrs. Sarah Ashman, Psychologist, Indiana State School for the Blind, India-  
napolis, Indiana

Dr. Joan Chase, Associate Professor, Rutgers Medical School, Piscataway, New  
Jersey

Dr. Phil Gris  , Consultant, Assessment Section, State of Florida, Tallahassee,  
Florida

Mrs. Anne Hayes, Teacher, Tennessee School for the Blind, Nashville, Tennessee



Fundamental Mathematics Concepts for Physically Handicapped Students

- Mrs. Sandra Albrecht, Early Childhood Specialist (formerly with the Florida School for the Deaf and the Blind), St. Augustine, Florida
- Mr. Daniel Burch, Communications Specialist, Independent Living Center for the Deaf, New Orleans, Louisiana
- Mr. Anthony Evancic, Educational Supervisor, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania
- Dr. E. Glenadine Gibb, Professor of Mathematics, The University of Texas, Austin, Texas
- Dr. Harry Lang, Associate Professor, National Technical Institute for the Deaf, Rochester Institute of Technology, Rochester, New York
- Mr. Richard Morris, Supervisor of Multihandicapped Blind, San Diego Unified School District, San Diego, California
- Dr. Evelyn Neufeld, Associate Professor, School of Education, San Jose State University, San Jose, California
- Dr. Ann Swanson, Chairman, Department of Physical Science, Edgewood College, Madison, Wisconsin
- Dr. Tuck Tinsley, III, Principal and Mathematics Specialist, Florida School for the Deaf and the Blind, St. Augustine, Florida
- Mr. Jerry Vandergrift, Educational Supervisor, Florida School for the Deaf and the Blind, St. Augustine, Florida

Teacher Evaluators:

- Ms. Lea Antonucci, Deaf-Blind Program, Albert Schweitzer School, San Diego, California
- Ms. Shelly Barron, Deaf-Blind Program, Albert Schweitzer School, San Diego, California
- Ms. Carol Crook, Deaf-Blind Program, Perkins School for the Blind, Watertown, Massachusetts
- Ms. Ollie Cummings, Deaf-Blind Program, New York Institute for the Blind, Bronx, New York
- Ms. Wendy DeLeon, Multihandicapped Blind Program, Laurel Ridge Elementary School, Decatur, Georgia
- Ms. Sandi Driben, Multihandicapped Blind Program, Florida School for the Deaf and the Blind, St. Augustine, Florida

- Ms. Melba Diane Fisher, Multihandicapped Blind Program, South-West Regional School for the Deaf and the Blind, Mobile, Alabama
- Ms. Katherine Futryk, Multihandicapped Blind Program, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania
- Ms. Karen Gauthier, Harahan Elementary School, Harahan, Louisiana
- Ms. Cinda Hubbard, Multihandicapped Blind Program, Fairmont School, El Cerrito, California
- Ms. Karol Jump, Vista Unified School District, Vista, California
- Ms. Debra Leff, Reilly Elementary School, Austin, Texas
- Ms. Diane McGarity, Multihandicapped Blind Program, Helen Keller Center, Alabama Institute for the Blind, Talladega, Alabama
- Ms. Lee Ann Meadows, Deaf-Blind Program, Atlanta Area School for the Deaf, Clarkston, Georgia
- Ms. Cyral Miller, Reilly Elementary School, Austin, Texas
- Ms. Angelyn Mills, Multihandicapped Blind Program, E. B. White School, New Orleans, Louisiana
- Ms. Kathleen Morris, Multihandicapped Blind Program, Albert Schweitzer School, San Diego, California
- Ms. Daisy Roberson, Deaf-Blind Program, Helen Keller Center, Alabama Institute for the Deaf and the Blind, Talladega, Alabama
- Ms. Mary Frances Ross, Multihandicapped Blind Program, South-West Regional School for the Deaf and Blind, Mobile, Alabama
- Ms. Elaine Spector, Ross Elementary School, San Diego, California
- Mrs. Alice Stabinsky, E. B. White School, New Orleans, Louisiana
- Ms. Clare Sullivan, Deaf-Blind Program, Atlanta Area School for the Deaf, Clarkston, Georgia
- Mrs. Bea Teal, Barrett Elementary School, Birmingham, Alabama
- Ms. Larinda Wagenhouser, Kaiser Elementary School, Houston, Texas
- Ms. Laurie Wasserman, Deaf-Blind Program, Perkins School for the Blind, Watertown, Massachusetts
- Ms. Marsha Williams, Multihandicapped Blind Program, Vista Unified School District, Vista, California

Ms. Paulette Willis, Deaf-Blind Program, Tyler Elementary School, Washington, D.C.

Ms. Charlotte Wood, Multihandicapped Blind Program, Hilltop Elementary School, Chula Vista, California

Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Dr. Natalie Barraga, Professor, University of Texas, Austin, Texas

Mrs. Janet Borsch, Spanish Teacher, Jefferson County Schools, Louisville, Kentucky

Mrs. Margaret Calvert, Infant Specialist, Elkhart County Rehabilitation, Elkhart, Indiana

Mrs. Pat Carpenter, Supervisor, Programs for the Visually Handicapped, DeKalb County Schools, Scottdale, Georgia

Mrs. Jan Cooper, Parent, Duncanville, Texas

Dr. Marvin Efron, Optometrist, West Columbia, South Carolina

Mr. José Feliciano, Musician, Los Angeles, California

Dr. Verna Hart, Professor, University of Pittsburgh, Pittsburgh, Pennsylvania

Mrs. Julia Joehl, Parent, Hummelstown, Pennsylvania

Mrs. Marcia Klafter, Parent Media and Library Director, Eastern Pennsylvania Instructional Resource Center, King of Prussia, Pennsylvania

Mrs. Irna Marshall, Parent-Infant Trainer, Washington Commission for the Blind, Seattle, Washington

Mr. Gary Mudd, Director of Special Projects, WHAS Radio, Louisville, Kentucky

Mr. Cliff Pogue, Media Specialist, Central Pennsylvania Instructional Resource Center, Harrisburg, Pennsylvania

Teacher, Parent, and Other Evaluators

Ms. Susan Aach, Infant Teacher, VIFTY House, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Ms. Judy Ackerman, Teacher, Ohio Bureau for the Visually Impaired, Cincinnati, Ohio

Ms. Sandra Agnew, Teacher, Project DART Allegheny Intermediate Unit, Pittsburgh, Pennsylvania



Ms. Ruth Anderson, Teacher, Maryland School for the Blind, Baltimore, Maryland

Ms. Dorothy Arensman, Teacher, Dodge City Public Schools, Dodge City, Kansas

Ms. Brenda Armstrong, Liaison, Iowa Braille and Sight Saving School, Vinton,  
Iowa

Ms. Linda Aussenberg, Media Specialist, VIFTY House, Western Pennsylvania  
School for Blind Children, Pittsburgh, Pennsylvania

Ms. Jamie Baggett, Teacher, Regional Education Service Center, Beaumont, Texas

Ms. Phyllis Baker, Teacher, Miami Public Schools, Miami, Florida

Mrs. Elaine Baldrige, Supervisor, Foundation for Blind Children, Scottsdale,  
Arizona

Ms. Carol Barker, Teacher, Alaska Blind-Visually Impaired Program, Anchorage,  
Alaska

Mrs. Sue Bast, Parent, Kansas City, Missouri

Mr. Alexandro Benavides, Special Education Coordinator, Chicago Public Schools,  
Chicago, Illinois

Mrs. Kim Benham, Parent, Salem, Oregon

Mrs. Gail Beyatte, Teacher, Maryland School for the Blind, Baltimore, Mary-  
land

Mrs. Mary Ann Bjorgaard, Parent, Kansas City, Missouri

Ms. Bonnie Blair, Physical Therapist, University of Massachusetts Medical  
Center, Worcester, Massachusetts

Ms. Jackie Brennan, Teacher, Keystone, AEA, Dubuque, Iowa

Ms. Mary Alice Brent, Teacher, Hays Public Schools, Hays, Kansas

Ms. Dottie Bridges, Teacher, Variety Club for Blind Babies, San Francisco,  
California

Mrs. Jane Brodie, Program Coordinator, Alaska State Department of Education,  
Anchorage, Alaska

Mrs. Maria Brown, Parent, Kansas City, Missouri

Ms. Nancy Ann Bump, Home-School Coordinator, Children's Center for the  
Visually Impaired, Kansas City, Missouri

Mr. and Mrs. Don Campbell, Parents, Wichita, Kansas

Ms. Mary Carr, Teacher, Alaska Treatment Center, Anchorage, Alaska

Mr. and Mrs. John Chowning, Parents, Campbellsville, Kentucky

Mr. and Mrs. Mando Cisneras, Parents, Plano, Texas

Ms. Jan Cook, Teacher, Lancaster-Lebanon Intermediate Unit 13, East Petersburg, Pennsylvania

Mrs. Nikki Coffman, Parent, Baltimore, Maryland

Mrs. Diane Crowell, Social Worker, Foundation for Blind Children, Scottsdale, Arizona

Mr. Ron Darcy, Teacher, Idaho State School for the Deaf and Blind, Gooding, Idaho

Ms. Sinnika Davis, Social Worker, VIFTY House, Pittsburgh, Pennsylvania

Ms. Brenda Deakin, Teacher, Delta Gamma Foundation for Visually Impaired Children, St. Louis, Missouri

Rev. and Mrs. Carroll de Forest, Parents, Gray Hawk, Kentucky

Mrs. Betty J. Dominguez, Teacher, New Mexico Preschool for the Visually Handicapped, Albuquerque, New Mexico

Mrs. Gail Donat, Parent, Salem, Oregon

Mr. and Mrs. Earl Downes, Parents, Miami, Florida

Ms. Linda Dyk, Teacher, Cardinal Hill Hospital, Lexington, Kentucky

Ms. Cynthia Estanich, Teacher, Connecticut State Board of Education and Services for the Blind, Hartford, Connecticut

Mrs. Rae Fellows, Vision Specialist, Children's Hospital Eye Center, Columbus, Ohio

Ms. Myette Felts, Teacher, Office for the Blind and Visually Impaired, Little Rock, Arkansas

Ms. Harriet Foiles, Director, Delta Gamma Foundation, St. Louis, Missouri

Mrs. Charlotte Forbes, Parent, Boston, Massachusetts

Mr. and Mrs. John Fountain, Parents, Paoli, Indiana

Mrs. Terry Geiger, Parent, Vinton, Iowa

Ms. Rochelle Givens, Infant-Preschool Teacher, Columbia Lighthouse, Washington, D.C.

Mr. and Mrs. Sandy Glenn, Parents, Omaha, Nebraska

Mrs. Caroline Gooden, Teacher, Cardinal Hill Hospital, Lexington, Kentucky

Ms. Maureen Gorman, Teacher, Hillsborough County Schools, Tampa, Florida

Ms. Laura Gray, Education Specialist, Delta Gamma Foundation for Visually Impaired Children, St. Louis, Missouri

Mrs. Michelle Gustafson, Salem, Oregon

Mrs. Fran Hammer, Program Specialist, Dallas Independent School District, Dallas, Texas

Ms. Tammy Hanahan, Teacher, Girard Public Schools, Girard, Kansas

Mr. and Mrs. Bill Handy, Parents, Middletown, Ohio

Mrs. Nancy Harp, Parents, Kansas City, Missouri

Ms. Nancy Hearn, Physical Therapist, United Cerebral Palsy Center, Denver, Colorado

Mr. Henry Hedgecock, Parent, Charlestown, South Carolina

Mrs. Karen Heesen, Parent, Janesville, Wisconsin

Mrs. LuAnne Hill, Parent, Kansas City, Missouri

Mrs. Patty Hillyard, Parent, Kansas City, Missouri

Mrs. Kathy Holmes, Grandparent, Louisville, Kentucky

Mrs. Reba Hubbard, Library Media Specialist, Wichita, Kansas

Mr. and Mrs. Bruce Hughes, Parents, Columbus, Ohio

Ms. Linda Hunstiger, Teacher, Anchorage Infant Learning Program, Anchorage, Alaska

Dr. Raymond Joehl, MD, Parent, Hummelstown, Pennsylvania

Mrs. Bonnie Johnson, Parent, Corvallis, Oregon

Mrs. Mary Ann Karstans, Supervisor, Omaha Public Schools, Omaha, Nebraska

Mrs. Linda Katskee, Parent, Omaha, Nebraska

Mrs. Jan Kautz, Teacher, Lancaster-Lebanon Intermediate, St. Petersburg, Pennsylvania

Mrs. Molly Kern, Parent, Tucson, Arizona

Mr. Richard King, Children's Services Specialist, South Carolina Commission for the Blind, Charleston, South Carolina



Mrs. Sheila King, Parent, Kansas City, Missouri

Mrs. Judy Klicker, Parent, Dover, Kentucky

Dr. Janet Klineman, Director, VIFTY House, Pittsburgh, Pennsylvania

Ms. Eve Kramer, Home Teacher, Children's Special Education Center, Kansas City, Missouri

Ms. Debbie Kruse, Teacher, Anchorage Infant Learning Program, Anchorage, Alaska

Ms. Susan Kurtzman, Teacher, Connecticut Board of Education, Wetherfield, Connecticut

Mr. and Mrs. Dan Lacore, Parents, Wichita, Kansas

Ms. Cathy La Forte, Teacher, New Mexico Preschool for the Visually Impaired, Santa Fe, New Mexico

Ms. Maxine Lavender, Chief, Child Study Center, Oklahoma Teaching Hospitals, Oklahoma City, Oklahoma

Mrs. Gail Lincoln, Parent, Morehead, Kentucky

Mrs. Mary Lonergan, Teacher, Connecticut Board of Education, Wetherfield, Connecticut

Mrs. Wanda Mango, Parent, Sturgeon Bay, Wisconsin

Mrs. Ena Martinez, Parent, Santa Fe, New Mexico

Ms. Libby McAleb, Teacher, Office for the Blind and Visually Impaired, Little Rock, Arkansas

Mr. Darrell McClung, Parent, Kansas City, Missouri

Ms. Barbara McDonald, Program Supervisor, New Mexico School for the Visually Handicapped, Alamogordo, New Mexico

Ms. Donna McKinley, State Department of Education, Lincoln, Nebraska

Ms. Sandra Meyer, Director of Correspondence Education, John Tracy Clinic, Los Angeles, California

Mrs. Sherrill Miller, Parent, Portland, Oregon

Ms. Debbie Miller-Wood, Teacher, Deaf-Blind Project, Auburn University, Alabama

Mrs. Jill Montoni, Parent, Boston, Massachusetts

Ms. Jeanine Moran, Teacher, Chicago Lighthouse, Chicago, Illinois

Mrs. Dotty Morgan, Parent, Wichita, Kansas

Mrs. Becky Morton, Parent, Salem, Oregon

Ms. Virginia Mosler, Teacher, Garden City Public Schools, Garden City, Kansas

Ms. Judy Murdock, Director, Tulsa Little Lighthouse, Tulsa, Oklahoma

Ms. Sandra Nevin, Infant Teacher, Marshall School, Castro Valley, California

Mr. Wayne Noble, Parent-Advisor Program Coordinator, Ogden, Utah

Mrs. Linda Nobles, Occupational Therapist, Children's Center for the Visually Impaired, Kansas City, Missouri

Mrs. Nancy Oberst, Infant Teacher, Omaha Public Schools, Omaha, Nebraska

Dr. Rosemary O'Brien, Director of Vision Services, Montgomery County Schools, Bethesda, Maryland

Mrs. Donna Padgett, Parent, Crystal River, Florida

Ms. Maxine Papermaster, Teacher, Center for Blind Children, Milwaukee, Wisconsin

Mrs. Ardis Pitello, Program Supervisor, Arizona State School for the Deaf and Blind, Tuscon, Arizona

Ms. Dawn Pontow, Teacher, Colby Public Schools, Colby, Kansas

Mrs. Angela Pratt, Director, Wichita Council for Preschool Children, Wichita, Kansas

Ms. Gayle Prillaman, Teacher, Arizona State School for the Deaf and Blind, Tuscon, Arizona

Mr. and Mrs. Mike Puckett, Parents, Bradenton, Florida

Mrs. Judith Raikes, Foster Parent, Columbus, Ohio

Ms. Linda Ray, Teacher, Shawnee Mission Public Schools, Shawnee Mission, Kansas

Ms. Sherry Raynor, Supervisor Infant Program, Perkins School for the Blind, Watertown, Massachusetts

Mr. and Mrs. Jerry Reece, Parents, Kansas City, Missouri

Ms. Mary Settle Reid, Teacher, Oregon State School for the Blind, Salem, Oregon

Mr. John Reilly, Teacher, Connecticut Services for the Blind, Wethersfield, Connecticut

Mrs. Connie Ritchey, Parent, Salem, Oregon

Mr. Lee Robinson, Parent, Austin, Texas

Ms. Robyn Roller, Children's Director, Lighthouse of Houston, Houston, Texas

Mrs. Barbara Rooney, Parent, Elm, Pennsylvania

Mrs. Patricia Rosner, Parent, Baltimore, Maryland

Ms. Lisa Rothermich, Teacher, Topeka Public Schools, Topeka, Kansas

Mrs. Kathy Routh, Parent, Vinton, Iowa

Mrs. Tatiana Ryan, Teacher, Hillsborough County Schools, Tampa, Florida

Ms. Dot Shymansky, Nurse, Wheeling Society for Crippled Children, Wheeling,  
West Virginia

Ms. Ann Silverrain, Visually Impaired Infant-Parent Training, San Antonio,  
Texas

Mrs. Charli Sirmans-Culver, Teacher, DeKalb County Schools, Scotsdale,  
Georgia

Mrs. Michelle Smith, Parent, St. Petersburg, Florida

Mrs. Nancy Smith, Preschool Teacher, Wisconsin School for the Visually Handi-  
capped, Janesville, Wisconsin

Ms. Rebecca Stuebner, Teacher, Anchorage Infant Learning Program, Anchorage,  
Alaska

Ms. Claire Sullivan, Infant Preschool Supervisor, New York Association for  
the Blind, New York, New York

Mrs. Nancy Sullivan, Parent, Watertown, Massachusetts

Ms. Suzanne Swaffield, Program Supervisor, South Carolina Commission for the  
Blind, Columbia, South Carolina

Dr. Stewart Teplin, MD, University of North Carolina, Chapel Hill, North  
Carolina

Mr. Chris Thompkins, Director, Dallas Services for the Visually Impaired  
Children, Dallas, Texas

Ms. Jenny Todd, Social Worker, Boston Center for Blind Children, Boston,  
Massachusetts

Ms. Mary Ann Tomlin, Director, Office for the Blind and Visually Impaired,  
Little Rock, Arkansas



Mr. and Mrs. Jeff Tuckey, Parents, Medford, Oregon

Ms. Julie Urban, Infant Teacher, Perkins School for the Blind, Watertown, Massachusetts

Ms. Susan Wamsley, Parent, Denton, Maryland

Mrs. Daniel Ward, Parent, Boston, Massachusetts

Ms. Faith Whittle, Teacher, Connecticut State Board of Education and Services for the Blind, Hartford, Connecticut

Ms. Lynn Widamen, Teacher, Idaho State School for the Deaf and Blind, Gooding, Idaho

Mrs. Jeanna Wilson, Infant Teacher, Dallas Services for Visually Impaired Children, Dallas, Texas

Mrs. Michelle Watts, Teacher, Division of Blind Services, Tampa, Florida

Mrs. Jan Wetzel, Parent, Corvallis, Oregon

Mrs. Bette Whiteside, Teacher, Children's Special Education Center, Kansas City, Missouri

Ms. Debbie Young, Teacher, Anchorage Infant Learning Center, Anchorage, Alaska

Ms. Lynne Young, Director Educational Services, Division for Visually Impaired, Wilmington, Delaware

Mrs. Carolyn Younker, Parent, Vinton, Iowa

Ms. Jan Zollinger, Teacher, Idaho State School for the Deaf and Blind, Gooding, Idaho

#### Light Box Materials Level II

Ms. Pat Carpenter, Supervisor, Programs for the Visually Handicapped, DeKalb County Schools, Scottsdale, Georgia

Ms. Nan Dempsey, Supervisor of Vision Program, New Jersey Commission for the Blind and Visually Impaired, Newark, New Jersey

Dr. Marvin Efron, Optometrist, West Columbia, South Carolina

Ms. Kay Ferrell, National Consultant in Early Childhood, American Foundation for the Blind, New York, New York

Ms. Ruth Holmes, Low Vision Teacher and Coordinator, Illinois School for the Visually Impaired, Jacksonville, Illinois

Ms. Beth Langley, Supervisor of Teachers of the Visually Impaired, Pinellas County Schools, St. Petersburg, Florida

Teacher Evaluators:

Ms. Claudette Coakley, Kentucky School for the Blind, Louisville, Kentucky

Ms. Linda Gifford, Prospect School, Clarendon Hills, Illinois

Ms. Susan McDonald, Foundation for Blind Children, Scottsdale, Arizona

Ms. Darlene Middleton, Kentucky School for the Blind, Louisville, Kentucky

Multihandicapped Needs Assessment Meeting

Mrs. Pat Carpenter, Supervisor, Programs for the Visually Handicapped, DeKalb County Schools, Scottsdale, Georgia

Dr. Marvin Efron, Optometrist, West Columbia, South Carolina

Dr. Kay Ferrell, National Consultant in Early Childhood, American Foundation for the Blind, New York, New York

Mrs. Judy Goodrich, State Coordinator of Programs for Deaf-Blind Students, Kentucky Department of Education, University of Kentucky, Lexington, Kentucky

Patterns Power Library

Miss Freda Henderson, Curriculum Director (Retired), Tennessee School for the Blind, Monkton, Maryland

Mrs. Alice Queenon, Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Mrs. Deanne Yaeger Scoggins, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Read Again

Ms. Pam Cannon, Teacher, Atlanta Area Services for the Blind, Atlanta, Georgia

Ms. Margie Cernitz, Teacher, Montgomery County Schools, Bethesda, Maryland

Ms. Marietta Howington, Teacher (Retired), Tennessee School for the Blind, Nashville, Tennessee

Ms. Marjorie Miller, Assistant Director, Professional Services, Chicago Lighthouse for the Blind, Chicago, Illinois

Dr. Roseann Reid, Chairman, Education Department, Greater Pittsburgh Guild for the Blind, Bridgeville, Pennsylvania

## Tangible Graphs

### Teacher Evaluators:

- Ms. Linda Jane Almasy, Connecticut State Board of Education and Services for the Blind, Wethersfield, Connecticut
- Ms. Virginia Battles, Arkansas School for the Blind, Little Rock, Arkansas
- Ms. Suzi Bogom-Haselkorn, Rockville High School, Vernon, Connecticut
- Ms. Anna Lee Braunstein, Mira Loma High School, Sacramento, California
- Ms. Cheryl Campodonico, Laurelwood Elementary School, Santa Clara, California
- Mr. John Ed Chiles, Arkansas School for the Blind, Little Rock, Arkansas
- Ms. Caroline Claverie, San Diego Unified School District, San Diego, California
- Ms. Fran Crystal, Victor Elementary School, Torrance, California
- Ms. Kathy Dempsey, Monterey County Office of Education, Special Education, Salina, California
- Ms. Deanne Doorlag, San Diego Unified School District, San Diego, California
- Ms. Nancy Egel, Missouri School for the Blind, St. Louis, Missouri
- Ms. Vivian Glover, The Governor Morehead School, Raleigh, North Carolina
- Dr. Robert Gowan, Integrated Program for Hearing Impaired, Dysphasia, and Visually Impaired, San Mateo, California
- Dr. Fareed Haj, FDLRS, Miami, Florida
- Ms. Jan Harlow, Minnie Gant School, Long Beach, California
- Ms. Frank Holtzman, Jordan Intermediate, Garden Grove, California
- Mr. Tom Kellis, Berkeley High School, Berkeley, California
- Ms. Carol Lewis, Sunnyside School, Garden Grove, California
- Ms. Margaret Martin, Arkansas School for the Blind, Little Rock, Arkansas
- Mrs. Mary Ellen Melone, John Mills School, Alhambra, Illinois
- Ms. Sue Mendiara, San Mateo County Office of Education, Integrated Program for Hearing Impaired, Dysphasia, and Visually Impaired, San Mateo, California
- Mrs. Kathy Miller, Glenbard E. High School, Lombard, Illinois
- Mr. Dwight Moore, Utah School for the Blind, Ogden, Utah



Mr. Donald Neale, W. Ross Macdonald School, Brantford, Ontario, Canada

Mr. Ned Olson, Washington State School for the Blind, Vancouver, Washington

Ms. Josephine Pohl, Washington State School for the Blind, Vancouver,  
Washington

Ms. Juanita Ramage, Oakland Unified School District, Oakland, California

Mrs. Louiedean Ray, Missouri School for the Blind, St. Louis, Missouri

Ms. Beverly Smay, San Diego Unified School District, San Diego, California

Ms. Betty Stanley, The Governor Morehead School, Raleigh, North Carolina

Mrs. Blanch Wilson, Utah School for the Blind, Ogden, Utah

Mr. Robert Wilson, Castro Valley Unified School District, Castro Valley,  
California

Ms. Sally Yeatman, McAteer High School, San Francisco, California

Ms. Margaret Young, W. Ross Macdonald School, Brantford, Ontario, Canada

Mr. Al Zimmerman, Bolsa Grande School, Garden Grove, California

Research and Developmental Personnel for FY 1983

|                       |   |
|-----------------------|---|
| Barth, John, PhD      | Research Scientist                      |
| Bensinger, Sharon, BS | Research Assistant                      |
| Berlá, Edward, PhD    | Research Scientist (part time/July-Aug) |
| Bolin, Gene           | Library Clerk/Clerk Typist              |
| Caton, Hilda, EdD     | Research Scientist (part time)          |
| Cundiff, Kerry, BA    | Editorial/Research Assistant (July-Jan) |
| Davis, Gary           | Mechanical Designer*                    |
| Duckworth, Bill, MS   | Librarian/Research Scientist            |
| Franks, Frank, EdD    | Research Scientist                      |
| Frere, Suzette, BA    | Research Assistant                      |
| Glass, Robert, MEd    | Research Associate                      |
| Moore, Sheri, MS      | Research Scientist                      |
| Morris, June, MA      | Director                                |
| Pester, Eleanor, MS   | Research Associate                      |
| Poppe, Tom            | Model and Pattern Maker*                |
| Walsh, Jeannette      | Secretary                               |
| Willis, Deborah, BA   | Research Associate                      |

\*Design and Development Section

Publications during FY 1983

Barth, J. L. The development and evaluation of a tactile graphics kit. Journal of Visual Impairment & Blindness, 1982, 76, 269-273.

Barth, J. L. Graph literacy: A neglected area. Paper presented at the First International Symposium on Maps and Graphics for the Visually Handicapped, Washington, D.C., March 10-12, 1983.

Franks, F. L. Applying educational research to maps and graphics for the visually handicapped. Paper presented at the First International Symposium on Maps and Graphics for the Visually Handicapped, Washington, D.C., March 10-12, 1983.

Moore, S. B. Student-Use Educational Materials Developed for the Multi-handicapped Visually Impaired. Journal of Special Education Technology, 1982, 5, 26-28.

INTRODUCTION TO MEASUREMENT IN MATHEMATICS/METRIC MEASUREMENT PROGRAM

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DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES

FISCAL 1984

**American  
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For The Blind  
Incorporated**

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Fiscal 1984 was a year in which a number of major projects were completed or neared completion. Simultaneously, new projects were identified to address current needs and work continued on ongoing projects. Projects winding down included Home-Based Media Approach for Developing Skills in Young Visually Impaired Children; Light Box Materials: Level II; Fundamental Mathematics Concepts for Physically Handicapped Students; The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers; and Plate Embossing System for Tactile Graphics. As products resulting from these and other research and development projects entered the American Printing House for the Blind's production pipeline, research staff worked closely with production staff to assure the end products meet specifications set as the products were developed and evaluated. Ongoing projects included ones in the areas of low vision and braille. New areas of endeavor span an array of topics. They include development of materials to train use of microcomputers, applications of microcomputer technology, development of a braille language program to parallel *Patterns*, development of training materials targeted at specific skills for use in prevocational programs, development of age appropriate training materials for use with adolescent multihandicapped persons, and mathematics drill and applications materials.

New products resulting from the efforts of the Department of Educational Research include:

New Products Released during FY 1984

Continental Relief Map Cassette Program: Australia  
Light Box  
Light Box Materials: Level I  
*Patterns Library Series*: First Reader  
*Patterns*: Third Reader Level  
Stanford Achievement Test, 1982 Series (Forms E and F)  
*The World Book Year Book 1982 and 1983*, Recorded Edition

New Products To Be Released Early in FY 1985

Bright Sights: Learning to See  
FOCUS in Mathematics  
Academic Program  
Multihandicapped Program

Home-Based Media project materials

*Playing the Crucial Role in Your Child's Development* (slide-cassette)

*Beginnings: A Guidebook for Parents and Teachers Working with Young Visually Impaired Children*

Meterstick

*Patterns Library Series: Second Reader*

Tangible Graphs

The research program at the American Printing House for the Blind enjoys an unique position of mutual dependence with the field. Through research efforts, information and products result making possible better service to the students and trainees for whom we share mutual concern and responsibility; but, without persons in the field who give willingly of their time and expertise to work with us, our work could not be effective. The listings of agencies and consultants included with this report provide only a partial acknowledgment of those who have shared in our work. They do not reflect the regular communication the research staff has with the field through contacts with parents, teachers, and administrators as the staff travels, converses with students, consumers, and colleagues, and responds to a myriad of queries for information by phone and mail.

Under the headings of Early Childhood and Multihandicapped, Prevocational, Low Vision, Braille, Mathematics, Tactile Graphics, Educational Measures, Microcomputer Application, and Other Research, summaries of specific research and development activities are given.

Gary Davis and Tom Poppe, of the Department of Educational Research's Design and Development Section, play primary roles in the design and development of experimental materials. Additionally, they are responsible for production tooling for many of the educational aids approved for production. This procedure assures products are designed for ultimate manufacture and the prototypical models used for evaluation closely resemble ultimate production models.



## Early Childhood and Multihandicapped

### Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Purpose: To develop a set of materials, targeted for professionals and parents, to assist in developing critical skills in visually impaired children, birth-24 months

Work completed during FY 1984. The Home-Based Media project is targeted for professionals and parents working with young visually impaired children at a birth-24 month level. The project contains three major components: a manual for professionals and parents, a slide-cassette program on structuring learning activities, and an electronic sound-producing sensory mat. The manual and slide-cassette program are scheduled for fall 1984 availability.

Final evaluation of the slide-cassette program, entitled Playing the Crucial Role in Your Child's Development, was completed by approximately 35 educational programs. These programs completed both professional and parental evaluation forms providing information such as content thoroughness and interest; musical background technical quality; program clarity; potential usefulness; narrator's voice, photographic quality; organization of the presentation, and so on. These data were compiled, analyzed, and necessary revisions were designed and completed. An original sound track, specifically written for the program by José Feliciano, was recorded by Mr. Feliciano and then integrated into the revised narrative tract. Master tapes were made and dubbed for use with both automatic and manual advance systems.

The manual was evaluated by over 75 professionals and parents who work with visually impaired children functioning at a birth-24 month level. Every suggestion for additions, deletions, or improvement was recorded and analyzed for trends and grouping of suggestions. Listings of revisions were determined by paragraph for the 100 page manual. Extensive revisions were made, incorporating a great number of the suggestions of the evaluators. After the content was finalized, pictures were obtained and selected for inclusion in the manual. Preparation was begun on a final editing and layout of the manual, coordinated with Printing House Editorial Department staff.

The sensory mat was critiqued by both long and short term on-site evaluations. Evaluating programs provided a variety of information about the mat: durability; safety; child interest; flexibility in use; reliability; usefulness in developing critical skill areas, and so on. These data were compiled, analyzed, and revisions were determined. Through the assistance of the Oak Hill School technology department and Printing House electronic technicians, major improvements were made allowing for reinforcers other than sound (air, vibration, etc.). Additional work by Printing House production personnel to make the prototype mats suitable for production is underway. Long term evaluative videotape studies of three visually impaired children using the sensory mat were filmed and analyzed for additional child data information.

The Home-Based Media materials were revised and submitted for production approval in October 1983. All three components were approved. Since this time, project staff has continued to work on final editing, design, layout, and specifications with production and editorial personnel. A final report, detailing total project and development efforts, was completed in May 1984.

The project was funded by a federal grant from the Special Education Programs of the U.S. Department of Education in combination with Printing House research monies.

Sheri Moore directed this project, assisted by Sharon Bensinger.

#### Materials for Adolescent Multihandicapped Visually Impaired Students

Purpose: To develop and evaluate a set of materials useful in meeting identified needs of adolescent multihandicapped students who have achieved basic skill levels

Work planned for FY 1985. A major project, involving a number of components, has been formulated for meeting the needs of adolescent multihandicapped visually impaired students who have obtained basic skill levels. The materials would include components in the following basic content areas: sensory, prevocational, life skills, survival skills, and self-help. Current projections of overall project content includes the following general areas of identified materials needs (Needs Assessment Meeting, January 1983):

Adolescent Sensory Stimulation Kit--an adapted, "older" version of the present Sensory Stimulation Kit, targeted towards low-functioning multihandicapped visually impaired students, 13-18 years old. Purpose would be to provide sensory stimulation/development materials and activities, using age-appropriate materials.

Daily Living Skills Kit--a kit, or series of kits, targeted for preadolescent and adolescent multihandicapped visually impaired students to develop self-help and daily living skills. The kit materials would focus on building independence in such areas as shaving, makeup application, hair care, menstruation, dressing, and coordinating clothes, etc.

Life skills cassette programs--a series of self-programmed cassettes with written support materials, targeted for the preadolescent and adolescent multihandicapped visually impaired student. Life skills content to be addressed should include the following: greeting people, street behavior, mannerisms, table manners, shopping, getting help from others, handling problems in the workshop/on the job.

Survival skills awareness and development--a set of training materials to support the learning of various environmental signs used in daily life. The tangible materials should include signs as they appear environmentally with the addition of the accompanying braille or large type word(s). Signs/words for inclusion: stop sign, exit sign, fire alarm box, in/out, toilets/restrooms (women, men), danger, men at work, keep out, etc.

A small group of consumers, whose programs and services involve adolescent multihandicapped visually impaired students, attended a June 1984 meeting to discuss more specific and detailed project materials. This group agreed that more direct service providers should be polled as to materials needs, suggestions, and specifications. The project is formally scheduled to begin in the fall of 1984, following the additional input of teachers and others who will specifically identify needed materials for the adolescent multihandicapped visually impaired student.

Sheri Moore will serve as project leader.

#### Fine Motor Development Materials

Purpose: To evaluate production modifications to materials designed to assist young visually impaired children in the development of fine motor skills, birth-48 month level

Work completed during FY 1984. The motor materials were reevaluated by a total of six infant, preschool, and multihandicapped programs for visually impaired children. The reassessment of these materials became necessary when substantial design changes were made for the purpose of making production of the motor items more cost efficient. The six evaluations were conducted along with the field evaluation of the Developing Vision through Lights project. A variety of evaluative data was collected, including information on item reliability, durability, design, potential usefulness, and so on.

Work planned for FY 1985. As evaluation data are received, they are posted and later collectively analyzed. Revisions will be determined as a result of the evaluation data. These materials, already approved for production, will be entered in the American Printing House production pipeline in the fall of 1984.

Sheri Moore directed this project.

#### Prevocational

#### Prevocational Skills Development Materials II

Purpose: To develop a prevocational skills kit that will be designed to utilize the same skills required by the existing kit but at a higher level

Work planned for FY 1985. A literature and existing materials review will be conducted to ascertain developments since 1979. The existing *Prevocational Skills Development Materials* kit includes a review of this information up until that date.

A meeting will be held with a prevocational advisory committee composed of three highly knowledgeable people in this field. This committee will determine specifications for the prototype materials, using as a basis ideas given in the proposal for this project. These materials will be developed



and evaluated in the field. The kit will require manipulation by hand and use of tools. It will be designed to involve the user in multiple assembly tasks and also to enable several students to work together in an assembly process.

Subjects for the study will be enrolled in programs which have a prevocational component. They will have at least one severe handicapping condition in addition to legal blindness. The target age for this population will be age 10 and higher.

Data collected will include information on the manipulability of the prevocational materials, durability, safety, appropriateness, interest level of the students relative to similar materials, effectiveness in teaching identified skills, and the value, need, and extent of accompanying written materials.

Suzette Frere and Tom Poppe will assist Bill Duckworth on this project.

#### Low Vision

##### Bright Sights (Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students, birth-36 months)

Purpose: To develop a kit of materials, divided into two levels of difficulty (sensory and perceptual), useful in assisting visually impaired students functioning at a birth-36 month level to learn to use remaining vision

Work completed during FY 1984. Bright Sights project staff has continued to offer on-going support and assistance to production and editorial personnel working with the Bright Sights materials. When needed, research staff assisted in locating and evaluating substitute items for the production kit of materials. The first available production set of materials will be taken to U.S. Testing Laboratories for safety and durability evaluation in September 1984. A fall 1984 release date of Bright Sights: Learning to See is expected.

Sheri Moore has coordinated this phase of the project.

##### Light Box Materials: Level II

Purpose: To develop a set of materials and related activities to use with the *Light Box* to facilitate the development of residual vision in children functioning from 3-5 years of age

Work completed during FY 1984. Plans were made in July 1984 for the collection of student use data and teacher critiques in the final evaluation of the Light Box Materials Level II. A teacher questionnaire was devised to poll teachers' opinions of the safety, durability, design, and usefulness of each of 12 kit items. Additional questions sought comments on the organization and clarity of written materials and division of activities into "skill areas," as well as suggestions for new activities and kit items. Student forms were

designed to gather information concerning each experimental student's age, visual handicap, functional vision, and overall reaction to the Level II Materials. To collect student use data, a 50-item pretest/posttest was developed. The test was based upon activities drawn from the *Level II Activity Guide*, though different materials were used in its administration. During development, the test was given to three sighted and two visually handicapped children between 3 and 6 years of age in order to refine test items and determine the length of time required to administer each one.

As evaluation forms were being developed, efforts were made to locate appropriate evaluation sites. It was determined that student use data be collected on low vision students 3-5 years of age, who functioned near age level and who did not have additional handicaps. In selecting evaluation sites, an attempt was made to locate those with at least six such students served by a single teacher, for a total participation of 30 students evenly distributed among age groups. In actuality, seven teachers and 27 students at seven sites were able to complete the evaluation process.

Before the evaluation period began, a project staff member visited each site to administer the pretest to all students involved in the study. Participating teachers were asked to use the Level II Materials from 60-90 minutes per week with each of the experimental students for a 9-week period. At the end of this time, the project staff member returned to administer the posttest.

Student use data were collected throughout the fall of 1983. In January 1984 the data were analyzed. An improvement score was calculated for all students based on pre and posttest differences. A Mann-Whitney U test revealed that the bulk of the experimental group's scores were higher than the control group's scores at a significance level of  $p < .025$ , indicating the Level II Materials were effective in improving visual efficiency as measured by the pretest/posttest.

Participating teachers completed the teacher questionnaire and student forms devised for the evaluation. Teachers rated all students' interest in the Level II materials as "greater than his/her usual interest in vision training activities." Based upon teacher observation, 92% of the students attended longer to tasks performed on the Light Box than to similar tasks performed without its aid. Ninety-two percent of the students asked, of their own initiative to use the materials and many spontaneously made favorable comments about the activities and materials. Questionnaires indicated teachers were quite satisfied with all written materials and most tangible items. They requested that more Parquetry Pieces, Cubes, Sticks, and Pictured Objects be provided. A thicker material was suggested for the Pattern Guides and Templates, and an additional, smaller Template was requested. Eight of the 12 items were rated high in potential usefulness by 83-100% of the evaluators; three remaining items were rated of moderate to high usefulness by all evaluators. Only one item received a low rating from an evaluator; 83% of the evaluators still rated this item of high or moderate usefulness.

Following analysis of the data, revisions to the materials were determined and specifications for all tangible materials were given to Production. Work on the *Level II Activity Guide* and *Activity Sheets* has been completed and the final drafts marked for typesetting.

Suzette Frere has directed this project.

### Light Box Materials: Level III

Purpose: To develop a set of materials and related activities to use with the *Light Box* to facilitate the development of residual vision in children functioning from 4-6 years of age

Work previously completed. The initial task of identifying materials and skills to be addressed by the Level III Materials was done during the development of the Level II Materials, when it was decided that two kits be developed from the large set of materials proposed by project consultants and respondents to a teacher questionnaire. Plans were made to complete Level II Materials before proceeding with development of Level III items. Level II Materials have been released to Production; therefore, development of Level III items may be pursued. Like the materials which have preceded it, the Level III Materials will utilize opaque and transparent, colored items against the high contrast background afforded by the *Light Box*. As approved by a committee convened in January 1983, the Level III Materials will provide instruction in the following skills: (a) prewriting skills, (b) matching (pictured objects, abstract figures, letters, numbers), (c) categorizing (pictured objects, abstract figures, letters, numbers), (d) visual memory (differing detail, letters, numbers), (e) figure-ground differentiation (pictured shapes, objects, letters, numbers), and (h) part/whole relationships (pictured objects, abstract patterns, letters, numbers).

The materials proposed for the Level III Materials are intended to teach these skills. They will include a set of acetate cards picturing objects, actions, abstract figures, letters, and numbers. These may be used interchangeably in several game formats. Practice will be provided in matching pictures with differing detail and in spotting missing details. Large pictured scenes containing many objects will permit practice in figure-ground differentiation, and a variety of picture puzzles will be included. Additionally, *Activity Sheets* like those included in the Level II Materials, will offer practice in matching pictured objects, abstract figures, letters and numbers; figure-ground differentiation; visual closure; and prewriting skills. An *Activity Guide* accompanying the kit will provide written activities, grouped according to the skill each develops.

Work planned for FY 1985. A set of rough prototypes will be constructed by mid-August and critiques of the items gathered from two consultants, who will briefly use the materials with students functioning from 4-6 years of age. The materials will be revised as indicated. Six sets will be produced for field evaluation and drafts of the *Activity Guide* and *Activity Sheets* will be completed during the fall of 1984.



In January 1985, the Level III Materials will be sent out for field evaluation. Both teacher critiques and student-use data will be obtained during an 8-9 week evaluation period. Subjects will be low vision students functioning from 4-6 years of age who have already demonstrated an ability to match pictured shapes (circle, square, triangle, rectangle); match large, simple pictures of familiar objects; and duplicate simple parquetry and pegboard patterns.

Suzette Frere has been responsible for this project.

### Developing Vision through Lights

Purpose: To identify a set of light related materials that prove useful in developing remaining vision in visually impaired students functioning on a birth-36 month level

Work completed during FY 1984. A set of 12 of the 17 originally tested light-producing materials are included in the final evaluation phase. A number of these items have been modified as suggested from the formative evaluation procedure. Formative evaluative information was generated, compiled, and analyzed to determine appropriate revisions, deletions, and materials that were suitable without revision. A selection of activities using each light item has been developed and placed for evaluation along with the tangible light items. The materials were placed in the field to be evaluated by teachers working with both young and multihandicapped students functioning in the birth-36 month developmental range. Evaluation forms have been developed to generate information regarding the safety, durability, reliability, usefulness, and appropriateness of the light-producing materials.

Work planned for FY 1985. As evaluations are received and data posted, an analysis will be made of all comments and suggestions made by evaluating teachers. From this data, a list of additions, deletions, and revisions will be generated and implemented. The activities and guidelines for teachers will be expanded, incorporating the suggestions of evaluating teachers. These materials will be presented for production approval at the Printing House annual meeting in October 1984.

Sheri Moore is assisted by Sharon Bensinger in this project.

### Identification of Research Needs in Low Vision

Purpose: To review and evaluate the existing research on low vision and to identify current research needs in low vision

Work planned for FY 1985. Workable descriptors will be identified for locating research on low vision, and criteria for evaluating the research will be determined. Using these descriptors and criteria, an extensive review of the existing research will be conducted, and a paper identifying current research needs in low vision will be written. It is expected that this project will be completed during the year.

Eleanor Pester will be responsible for this work.

## Braille

### Patterns: The Primary Braille Reading Program (Beginning Braille Reading Series)

Purpose: To develop a set of beginning reading materials specifically designed to minimize problems encountered by the beginning braille reader

Work completed during FY 1984. *Patterns* was completed this fiscal year when the Third Reader Level went on sale in November. Applications for copyrights for the Second and Third Reader levels of *Patterns* were submitted in December. In response to numerous requests, development of a scope and sequence chart was initiated for the *Patterns* series. Data on the posttest of *Patterns* continued to come in but, on some levels, at a slow rate. The goal is to have complete data on 50 posttests at each level to further evaluate the tests and refine them as needed.

Work planned for FY 1985. Work on the *Patterns* scope and sequence chart will be completed. Data from the Preprimer through Third Reader posttests will continue to be solicited, recorded, and analyzed.

Hilda Caton and Eleanor Pester are responsible for this project.

### Patterns Library Series

Purpose: To develop sets of braille books which succeed the levels of *Patterns: The Primary Braille Reading Program* from Preprimer through Third Reader and which provide a means of practicing reading and discovering that reading can be fun

Work completed during FY 1984. The Second Reader level of the *Patterns Library Series* was completed and turned over to production in May. The Third Reader level has been reviewed, revised, and will be ready for production as soon as all needed permissions to do the books in braille are received and illustrations completed.

Work planned for FY 1985. The Third Reader level of the *Patterns Library Series* will be turned over to production and assistance given, as needed, as the Second and Third Reader levels go through production.

Eleanor Pester is responsible for this project. She has been assisted by Eddy Jo Bradley, John Barth, and Suzette Frere.

### Read Again: A Braille Program for Adventitiously (Recently) Blinded Persons

Purpose: To develop a set of materials designed to teach braille to persons who have lost their vision after initially learning to read print

Work completed during FY 1984. The project's advisory committee was formed and met to make recommendations regarding the content and format of the program materials. A detailed set of specifications for the program was written, reviewed by the committee, and revised. The final specifications for the program call for two main parts: the first containing tactual discrimination activities and an introduction to Grade 1 braille; the second, Grade 2 braille. Materials for Part 1 were drafted. A survey of adventitiously blind people was undertaken to determine reading interests and to identify most useful vocabulary for new braille users.

Work planned for FY 1985. Part 1 will be prepared and sent to the consulting committee for review, revised, and prepared for production. Part 2 will be written, prepared for review, sent to the project's committee, revised, and prepared for production.

Hilda Caton is responsible for this project. She is assisted by Eleanor Pester. Eddy Jo Bradley is the directing editor.

### Braille Readiness Program

Purpose: To develop a comprehensive, sequentially organized braille readiness program

Work planned for FY 1985. A project is planned to revise, update, and supplement existing readiness materials, as necessary, to provide a comprehensive, sequentially organized braille readiness program. Work on this project is expected to be initiated during the year.

This project will be done by Hilda Caton and Eleanor Pester.

### Braille Language Program

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Work planned for FY 1985. Work on this new project will begin January 1985. It is anticipated that the end product will include a Readiness Level, for use in the latter part of kindergarden programs, and first, second, and third levels roughly corresponding to the primary grades. Each level will include student materials (texts, workbooks, posttests) and teachers' editions for both the spelling and English components, both of which will incorporate braille writing instruction. Specifications for the entire program will be



based on a review of relevant research, textbook analyses, an internal analysis of the braille code, and data from a pilot study (N = 50-75 fourth and fifth grade braille reading students) designed to identify specific deficit areas braille users experience in spelling and English. A committee of five braille experts, the project's linguist (Dr. Eric Hamp), and the project's directing editor (Mrs. Eddy Jo Bradley) will be involved in developing program specifications. Primary tasks to be performed during the first 6 months will be to conduct the pilot study, analyze research on performance of braille readers in spelling and English, analyze print spelling and English programs, and analyze *Patterns: The Primary Braille Reading Program* and correlate these data with analysis of print programs. The information yielded will be used in developing specifications for the program. Toward the end of this period, work will be initiated on the Readiness Level.

Hilda Caton will be the project director; Eleanor Pester the associate project director.

#### Identification of Research Needs in Braille

Purpose: To review and evaluate existing research on braille and to identify deficit areas in which additional research is needed

Work completed during FY 1984. This is a new project. The initial stages of the review were completed as a part of a project commissioned by the Braille Authority of North America.

Work planned for FY 1985. Additional existing research on braille will be reviewed, and all research will be evaluated. Deficit areas in which additional research is needed will be identified. A paper prioritizing these braille research needs will then be written. It is expected that this project will be completed during the year.

Hilda Caton is responsible for this project. She will be assisted by Eleanor Pester and Sharon Bensinger.

### Mathematics

#### Fundamental Mathematics Concepts for Physically Handicapped Students

Purpose: To develop instructional guides, with manipulative materials, to establish a content base for improving instruction in mathematics for blind students

Work completed during FY 1984. This project was conceived and conducted in three phases: development, evaluation, and dissemination. While the major thrust of the 3rd year (1983-84) activities was on dissemination, considerable time and energy have been expended in the preparation of the *FOCUS in Mathematics* editions for multihandicapped blind and for deaf/blind students. These two editions were presented and approved for production by the American Printing House for the Blind's Educational Research and Development Committee at its May 1984 meeting in Louisville.

The edition for multihandicapped blind students was evaluated by 12 teachers. More teachers than originally planned were included in the evaluation because of the wide range of differences in students and because highly successfully multihandicapped students function more like academic students. These teacher evaluators observed that no students--even with the same handicapping conditions--functioned or performed the same. The immediate response from teachers was the need for an individual manual or guidebook for each student and considerable space for writing in individualized adaptations. Teachers felt that they could work from the information included in the evaluation manual if it were broken down and if space was provided for further adapting the activities. The various categories of items suggested were analyzed and a decision made to provide this edition in a loose-leaf binder with special Response/Data Sheets providing space for adaptations. As many of these as needed can be inserted with the appropriate activity in the program. A manual for each student will provide an individual and on-going record of progress in mathematics and will include the specific adaptations required for each activity. The Response/Data Sheet includes space for rewriting an activity, blanks and space for specification of and notation on stimulus channels (e.g., tactual, auditory, kinesthetic), blanks and notations for environmental orientation needs, and space for identification of and practice with stimulus materials (the aids and materials used in the program) prior to their use in an activity. A wide range of manipulation and perceptual problems accompanying the visual loss further complicates instruction for a great number of these students.

The edition for deaf/blind students was evaluated by eight teachers who used the program (or relevant sections) with students from the kindergarten to the secondary grade level, in day school and in residential school settings. Decisive additions/adaptations to the program resulting from its field evaluation were: the inclusion of a second verbal version of instructions to deaf/blind students, differentiation between primary (e.g., same, different) and secondary (e.g., cork, block) vocabulary, the addition of sign illustrations (e.g., tall, short) for critical mathematics terminology, and a breakdown of entry level vocabulary by category (e.g., concrete materials, verbs).

Dissemination activities consisted of national, area, and regional workshops and of distribution of reference sets of materials to approximately 30 instructional resource centers for visually handicapped throughout the United States. Letters were sent to each center offering a set of the materials and proposing possible follow-up workshops. Similar offers were made to some 20 universities with programs for training teachers of visually handicapped students that were not in areas served by or in close proximity to the instructional resource centers. Responses have been impressive with more than 70% requesting sets of materials and several expressing interest in sponsoring teacher workshops.

Initial workshop sessions were held at the California Transcribers and Educators of Visually Handicapped Conference held March 22-24, 1984 in San Diego. The workshops were conducted to introduce the *FOCUS in Mathematics* program to educators and to get their suggestions for other workshops to be held across the country.

A statewide workshop was held in Austin for representatives of the 20 regional education service centers in Texas and for teachers from the Texas School for the Blind. A 2-day workshop for the New Jersey Commission for the Blind was conducted in Newark.

Work planned for FY 1985. Additional workshops will be held at the American Printing House's Annual Meeting in Louisville in October. The maximum number that can be accommodated in a workshop is 20-24 participants. Project staff will be available for FOCUS workshops throughout the 1984-1985 school year.

The three project manuals, and accompanying materials, will be produced and disseminated, and a final report completed.

This project is funded by the National Service Foundation. Frank Franks is the project director. Bob Glass is the project assistant.

#### Applications for Problem Solving in Prevocational Mathematics

Purpose: To prepare curriculum-based materials or modules which will improve and facilitate mathematics instruction in prevocational programs

Work planned for FY 1985. There is an absence of curriculum-based prevocational materials in mathematics which emphasize applications for solving problems in everyday life, gaining knowledge and skills necessary in using money, and making consumer decisions. Tentatively, this prevocational project will address the use of money which is critical to independent functioning and survival in day-to-day living. However, a survey of teachers in rehabilitation and vocational programs will be made to determine if a module on using money is considered to be a high priority need in these programs. If greater needs in mathematics are indicated, then the higher priority needs will be explored.

Problem solving activities and applications included will be based on real-life examples. The result of the project will be a student-use resource guide to real-life problems which the consumer faces in daily living. The resource guide will be based on the fundamental mathematics concepts presented in the *FOCUS in Mathematics* program. No hardware will be developed or adapted. Teachers in vocational/rehabilitation/career programs will critique the guide for content, format, and activity sequence. They will evaluate the guide for its appropriateness for the students they teach. These teachers will be asked to provide problems and applications for sections/modules which each feels has not received sufficient emphasis, and is in the contributor's area of expertise. The content will be prepared and reviewed by mathematics educators of blind students.

This project will be conducted by Frank Franks and Bob Glass.



## Practice Materials in Basic Computation and Problem Solving

Purpose: To develop sequenced, modular practice materials in basic computation and problem solving appropriate for use in grades 2-8 and for use in rehabilitation programs involved in mathematics instruction

Work planned for FY 1985. Participants in both the 1979 Meeting on Needs of Blind Students in Mathematics and the 1981 Material Needs Meeting in Rehabilitation of the Blind indicated considerable need existed for recorded, modular materials in computation and calculation suitable for both the student and the rehabilitating client. Three developments in recent research efforts have yielded: (a) a thorough scope and sequence listing of learning objectives in mathematics (grades k-6) arranged by leading experts; (b) publication of *Elementary Computation*, *Elementary Problem Solving*, and *Computation and Problem Solving for Young Adults* for use with the Speech+ Calculator; and (c) universally applicable guidelines for the development of audio-tutorial reference materials. Existence of these three resources will permit, in a timely and cost-effective manner, the undertaking of a project to provide practice materials in basic computation and problem solving.

The principal objective of this project is the development of sequenced, modular practice materials in basic computation and problem solving appropriate for use in grades 2-8 and for use in rehabilitation programs involved with mathematics instruction. The materials will be generic in nature and suitable for use in any classroom regardless of curriculum or computational devices employed (i.e., computer, calculator, abacus, finger math, mental math, or braillewriter).

Module topics in computation and application would include whole number addition, subtraction, addition and subtraction within the same problem, multiplication, division, multiplication and division within the same problem, decimals, fractions, calculations involving two or more operations, percentages, and negative numbers. Within each module, the content will be arranged in order of increasing difficulty under headings of "Basic Practice," "Advanced Practice," and "Practice for Experts."

Media under consideration for these materials are tape, disk, large type, and braille. No other hardware will be required. The program can be self-paced with correct solutions displayed immediately after each problem. As much as possible, word problems will be written for relevance to the daily life of the visually handicapped.

Teachers in elementary schools, in general mathematics classes, and in vocational/rehabilitation/career programs will critique the materials for content, format, and sequence. They will evaluate the program for its appropriateness for the students they teach. These teachers will be asked to provide problems and applications for sections/modules which each feels has not received sufficient emphasis, and is in the contributor's area of expertise. The content will be prepared and reviewed by mathematics educators of blind students.

Bob Glass and Frank Franks will be responsible for this project.

## Tactile Graphics

### The Development of Fundamental Skills in Tactile Graph Interpretation: A Program for Braille Readers

Purpose: To develop a program to teach blind students, grade 4 and above, graph reading skills

Work completed during FY 1984. The initial development of these materials was supported through a grant (No. G009001878) awarded to the American Printing House for the Blind by the Special Education Programs of the U.S. Department of Education. During the first part of FY 1984 a final report for the project was written and final revisions were made to the program materials prior to turning them over to production. The resulting product will be called Tangible Graphs. It will be available early in FY 1985.

John Barth was the project director.

### Plate Embossing System for Tactile Graphics

Purpose: To develop a mechanical system to upgrade the quality of tactile graphic displays produced at the American Printing House in a paper medium

Work completed during FY 1984. The punch and die sets which are used in the system to produce point, linear, and areal patterns were completed and tested for legibility. Forty-two braille readers in grades 7-12 participated in the legibility study which involved sets of 21 point symbols (which included three orientations of one), 16 linear symbols, and 14 areal patterns. Legibility was evaluated within sets by a matching procedure. Criterion for inclusion in the final working set was that the symbol be correctly identified by a minimum of 90% of the subjects. Of those tested, all 21 point symbols, 14 of the linear symbols, and 12 of the areal patterns met the criterion.

The primary embossing machine, which produces linear and areal patterns, was completed and placed in the Stereograph Department to be used regularly in the production of embossed graphics. The design and construction of the companion machine was begun in February 1984. This machine will have the capability of producing 20 selectable point symbols.

Work planned for FY 1985. The construction of the companion machine will be completed. It is expected to become operational during the fall of 1984.

Gary Davis has been responsible for the design and development of the plate embossing system. John Barth was responsible for the design and evaluation of the tactile symbology.

## Educational Measures

### Diagnostic Test of Grade 2 Literary Braille

Purpose: To develop a diagnostic test of the literary braille code

Work completed during FY 1984. Work continued on the development of the test. After the item pool of nine subtests was administered to 52 students, grades 4-12, the information was analyzed to choose items that would appear on the experimental edition.

The experimental edition of the test was administered to 150 braille reading students, grades 3-12. An adapted rate-of-reading test was given at the same time. Students participating were from public day school programs and schools for the blind in the states of California, Oklahoma, Connecticut, Florida, and at a residential school in Canada.

The third component of the assessment tools is an observational checklist of braille reading characteristics which was designed for teacher use. The checklist will be packaged with the diagnostic test.

Work planned for FY 1985. Data on both the Diagnostic Test of Grade 2 Literary Braille and the rate-of-reading test will be analyzed and technical, administrative, and diagnostic parts of the test manual written. The observational checklist of braille reading characteristics will be sent to braille experts to be critiqued. This project will be completed during the fall of 1984.

Bill Duckworth and Hilda Caton are responsible for this project. Earl Rankin, a test specialist and project consultant, is responsible for preparing the technical portion of the test manual.

## Microcomputer Applications

### Technology/Microcomputer Questionnaire Results

Purpose: (a) to determine the needs of visually handicapped students/clients using microcomputers and related equipment/software  
(b) to determine the "state of the art" with regard to technology/microcomputers

Work completed during FY 1984. In order to determine the greatest needs of the field and set priorities appropriately, it was apparent that information regarding the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons was needed. Two questionnaires were developed. Information was initially obtained from persons attending the 1983 Annual Meeting of the American Printing House for the Blind. The audience consisted primarily of state vision consultants and heads of residential program. Because of the great interest shown in the use of microcomputers for instructional purposes, results of the study are reported here.



### Trustee Responses

On the questionnaire, respondents were asked to rate the importance of a list of 30 potential applications and 34 developmental needs. The following is a list of the top choices on a scale of 1 (least need) to 5 (greatest need). The mean ratings are given in parentheses. They were: identification of commercial software accessible by low vision and blind persons (4.68), word processing (4.62), braille and speech translation programs for copyrighted software (4.55), training workshops for vision personnel in use of computers and adaptive peripherals (4.55), extensive communication network (4.53), software clearinghouse (4.51), support materials in large type, braille, and audio to accompany computer courseware (4.50), large type and braille manuals for computers, peripheral devices, programming, and applications programs (4.50), writing programs controlled by a versatile operating system that can be used on computers of many different kinds (4.47), and producing braille copy (4.45).

The last question on this questionnaire asked the respondents to list their three greatest needs in applying technology to the education or rehabilitation of blind persons. Of the 87 responses, 17 wanted information (clearinghouse) on accessible software, 16 information (clearinghouse) on microcomputer hardware and hardware interfacing, 13 training for vision personnel, 10 software adaptation/creation (CAI, applications), 8 funding, and 7 computer literacy materials (large type, braille, audio).

The second questionnaire requested information on the respondents' current inventory and/or planned acquisition of microcomputers, special peripherals, software, programs for teachers/students/clients, and what role they would like to have the American Printing House play in this area. Results of this survey showed that of the 66 microcomputers available in these schools or agencies, 41 were Apple, 6 were Radio Shack, and 4 were Commodore. Approximately one-half the monitors were color. The three most common sizes of monitors in use were 12" (16/42), 19" (8/42), and 13" (7/42). The voice synthesizers being used most were the Echo II (25/38), Votrax (4/28), and Total Talk (3/38). The large print monitors being used were Visualtek (6/14) and Apollo (2/14). Twenty-seven programs were using 29 VersaBraille paperless braille output devices. The hard copy brailers in use were the Cranmer Modified Perkins Brailier (17/24) and the LED 120 (5/25). The software most frequently purchased to adapt the equipment was Braille Edit (16/21). Twenty-nine out of 42 schools or agencies have programs for computer education of their teachers; 27 out of 40 for their students/clients.

Of the 60 responses to the question regarding the American Printing House's role in this area, 14 responded software adaptation/creation, 11 information (clearinghouse) on useable software, 7 information (clearinghouse) on computer hardware, 5 computer literacy materials, and 5 software on quota. The questionnaire responses came from a total of 34 different states distributed throughout the country.

The people who were given the initial questionnaires were also each given a "contact persons sheet" requesting the names and addresses of any other persons they knew of who were working with the visually handicapped in the

area of microcomputers. And prior to the Annual Meeting, in the May 1983 edition of *APH Notes* (#11), it was requested that anyone using microcomputers with visually handicapped students/clients contact the American Printing House. The same questionnaires that had been distributed at the Annual Meeting, with some additional questions for teachers/instructors actually attempting to use microcomputers with students/clients, were sent to these contact persons. The plan was to initiate an ongoing communication network with these people who will be predominantly teachers/instructors. Fifty of the teachers/instructors who were identified have completed the two questionnaires. These responses came from 20 states throughout the U.S., Washington, D.C., and Ontario, Canada.

### Teacher/Instructor Responses

When rated by persons actually using equipment, on a scale of 1 (least important) to 5 (most important), the following items were rated 4.5 (rounded off) or above: identification of commercial software accessible by low vision and blind persons (4.82), word processing (4.71), braille and speech translation programs for copyrighted software (4.71), software clearinghouse (4.69), training workshops for vision personnel in use of computers and adaptive peripherals (4.66), adaptation/creation of computer assisted instruction for blind students (4.64), large type and braille manuals for computers, peripheral devices, programming, and applications programs (4.62), support materials in braille, audio, large type to accompany computer courseware (4.56), adaptation/creation of computer literacy instruction for blind students (4.52), standard computer braille code (4.51), writing programs controlled by a versatile operation system that can be used on computers of many different kinds (4.50), extensive communication network (4.50), synthesized speech output devices (4.49), and hardware clearinghouse (4.48).

The last question on this questionnaire asked the respondents to list their three greatest needs in applying technology to the education or rehabilitation of blind persons. Of the 110 responses, 18 wanted software adaptation/creation (CAI, applications), 14 information (clearinghouse) on accessible software, 13 training or visually handicapped personnel, 12 information (clearinghouse) on microcomputer hardware and hardware interfacing, 10 communication network, 9 braille and large type manuals for access equipment, and 8 computer literacy materials (braille, large type, and speech).

The second questionnaire requested information on the respondents current inventory and/or planned acquisition of microcomputers, special peripherals, software, programs for teachers/students/clients, and what role they would like the American Printing House to play in this area. Results of this survey showed that of the 82 microcomputers available in these schools or agencies, 47 were Apple, 9 were Radio Shack, 8 were Commodore, 2 were IBM, and 6 were other brands. The voice synthesizers being used most were the Echo (33/48), Cybertalker (4/48), Votrax (4/48), Radio Shack (2/48), and other brands (5/48).

Thirty-three of the 50 respondents said they have a program or a proposed program for computer education of their teachers. The most common approaches to microcomputer instruction were through inservices/workshops (19), introductory courses in computers/programming/computer literacy (5), individual or



small group time with computer instructor (4), or the school district had a training program (3). Thirty-seven of the 50 respondents said they have a program or a proposed program for computer education of their students/clients. The most common types of microcomputer instruction were computer literacy (7), programming (4), braille students receive hands on experience/training in appropriate equipment (4), word processing (3), introduction to computers (3), individualized instruction (3), business applications/data processing/accounting (3), mainstreamed into computer lab (2), and CAI (1).

Of the 92 responses to the question regarding the American Printing House's role in this area, 20 responded software adaptation/creation, 16 information (clearinghouse) on usable software, 9 information (clearinghouse) on computer hardware, 7 computer literacy materials, 6 modifications on microcomputers/peripherals, 5 communication network/hotline, 5 manuals in braille and large type, 4 software and hardware on quota, and 4 programming instructional materials in braille, large type, and speech.

Debbie Willis and John Barth were responsible for this study. They were assisted by Sharon Bensinger and Jeannette Walsh.

#### Other Technology/Microcomputer Activities

Purpose: To provide teachers and their visually handicapped students with appropriate materials to enable students to access and use microcomputers and necessary peripherals in educational programs

Work completed during FY 1984. Two attempts have been made to obtain funding to enable the American Printing House for the Blind to serve as a clearinghouse. Neither attempt was successful.

John Barth, Gary Davis, and Debbie Willis attended a 1-week Program in Education of the Visually Impaired at Teachers College, Columbia University. The program was devoted to the most recent computer technological devices in the education of the visually handicapped.

Mrs. Eileen Young, an instructor in Computer Education at Spalding University and University of Louisville, came to the American Printing House to present an overview of how computers are being used in education.

*The Random House Book of Computer Literacy* by Ellen Richman (© 1983) was reviewed and selected as an excellent book for visually handicapped students. It was edited and will be available in braille and large type editions.

*The Apple Owner's Manual* and the *Echo Manual* have been reviewed and partially edited.

John Barth and Debbie Willis met with Dr. Sam Ashcroft to discuss microcomputers, Peabody College's involvement, American Printing House involvement, the modules developed at Peabody College under the direction of Dr. Ashcroft, and various other ideas related to access technology. At the



same time, John Barth and Debbie Willis visited the Tennessee School for the Blind to talk with its staff about microcomputers and related equipment and to observe students working with the microcomputers and various peripherals.

John Barth, while gathering data on a project at the Nebraska School for the Visually Handicapped, met with Mrs. Phyllis Brunken. Phyllis Brunken had used microcomputers in her classes with visually handicapped students for over 3 years. They discussed plans to develop materials for use with microcomputers by visually handicapped students.

Debbie Willis attended 1 week of a 2-week program on Computer Literacy for 11th and 12th grade legally blind students. The program was sponsored by the Division of Blind Services Rehabilitation Center in Daytona Beach, Florida.

Work planned for FY 1985. Final editing will be made on *Apple Owner's Manual*, *DOS User's Manual*, and the *Echo II Speech Synthesizer* for braille and large type editions. These were approved by the American Printing House for the Blind's Publication Committee at its May 1984 meeting.

Debbie Willis and Bob Glass will be responsible for the preparation of these materials.

#### Microcomputer Needs Meeting

Purpose: (a) to determine the needs of visually handicapped students using microcomputers and related equipment/software  
(b) to provide teachers and their visually handicapped students with appropriate materials needed to enable students to access and use microcomputers and necessary peripherals in educational programs

Work planned for FY 1985. In order to identify the problems and needs of visually handicapped students using microcomputers, a Microcomputer Needs Meeting is scheduled for August, 1984. The primary objectives of the meeting will be to: (a) identify and sequence materials needs, (b) plan or review keyboard familiarization materials, (c) develop specifications for a beginning level program, and (d) consider specific editing questions. A secondary objective will be to identify researchable questions related to this area.

Future work in this area will be determined as a result of the discussions and recommendations made during the Microcomputer Needs Meeting.

Debbie Willis will be responsible for conducting the meeting. She will be assisted by Bob Glass on the microcomputer applications projects.

## Other Research

### Academic Achievement

Purpose: To determine if legally blind students in academic programs are performing at the same level as their sighted peers

Work completed during FY 1984. A growing concern among educators of visually handicapped students is for the academic achievement of their students. Of the 41,145 legally blind students registered through the American Printing House in 1983, 24,112 (59%) were registered as having no handicapping condition other than blindness. Therefore, relatively normal academic achievement should be achieved by these students. In order to determine if this is the case, a national study of achievement is needed. The 1982 Stanford Achievement Test series would be a timely and appropriate tool to use. However, a question arose as to the feasibility of undertaking such a study due to the student and teacher time that would be required in administering the tests. Fourteen ex officio trustees were contacted regarding the likelihood of their states participating in such a study. Results indicated undertaking such a study, even at selected grade levels, would not be feasible.

Work planned for FY 1985. Most states currently administer minimum competency tests. It is not known how many include legally blind students in their testing programs. Ex officio trustees from all states will be contacted by phone to determine the states in which legally blind students are included in these programs. Using this information, the feasibility of attempting to compare performance between blind and sighted populations using information from minimum competency tests will be determined. If such a study can be done, it will be initiated.

Bill Duckworth is responsible for this project.

### Braillewriter Development

Purpose: To develop a new braillewriter

Work planned for FY 1985. Work will be initiated on the development of a new braillewriter. It is anticipated development may require 5 years. During the initial year, information will be obtained that will be used in determining specifications. Simultaneously, wooden models will be designed and built to study mechanical action.

Gary Davis will be responsible for this project.

### Beetz Notation Graph Survey

Purpose: To determine the effectiveness of a design change--using magnetism instead of pins to hold the musical notation in place

Work completed during FY 1984. Teachers who had ordered the *Beetz Notation Graph* and were using it with students were contacted by phone and asked to help evaluate the new model. After approximately 2 months, users were called again and interviewed by phone. Results were not conclusive regarding the effectiveness of the magnetism; however, additional problems which exist with the product were indicated. Because the *Beetz Notation Graph* is expensive to make, has a history of low sales, and is in need of major redesign, the decision was made to discontinue it.

Sharon Bensinger and Eleanor Pester were responsible for this survey.



Agencies Participating in Research during FY 1984

Alabama Institute for the Deaf and Blind; Talladega, Alabama  
Arkansas Enterprises for the Blind, Inc.; Little Rock, Arkansas  
Atlanta Area School for the Deaf; Clarkston, Georgia  
Atlanta Area Services for the Blind; Atlanta, Georgia  
Barrett Elementary School; Birmingham, Alabama  
Bureau of Rehabilitation Services for the Blind; Champaign, Illinois  
Burlington County Special Services; Mt. Holly, New Jersey  
California School for the Blind; Fremont, California  
Castro Valley Unified Schools; Castro Valley, California  
Center for Blind Children; Milwaukee; Wisconsin  
Children's Special Education Center, Kansas City, Missouri  
Chula Vista School District; Chula Vista, California  
Connecticut State Board of Education and Services for the Blind; Wethersfield, Connecticut  
Crittenden County Elementary School; Marion, Kentucky  
Dallas Public Schools; Dallas, Texas  
Dallas Services for Visually Impaired Children; Dallas, Texas  
Deaf Blind Intervention Program; Lexington, Kentucky  
Delta Gamma Foundation; St. Louis, Missouri  
Division of Blind Services Rehabilitation Center; Daytona Beach, Florida  
Division of Special and Compensatory Education; St. Paul, Minnesota  
Duncanwood School; Nashville, Tennessee  
E. D. White Elementary; New Orleans, Louisiana  
Eagle Mountain-Saginaw School; Fort Worth, Texas  
Fairmont School; El Cerrito, California  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
Frances Blend Elementary School; Los Angeles, California  
Ft. Lauderdale Public Schools; Ft. Lauderdale, Florida  
The Governor Morehead School; Raleigh, North Carolina  
Howard County Public Schools; Columbia, Maryland  
Jacksonville Public Schools; Jacksonville, Florida  
Jefferson Parrish Schools; Harahan, Louisiana  
Kaiser Elementary School; Houston, Texas  
Kansas Division of Services for the Blind; Topeka, Kansas  
Kentucky School for the Blind; Louisville, Kentucky  
Laurel Ridge Elementary School; Decatur, Georgia  
Leawood Elementary; Columbus, Ohio  
Maryland School for the Blind; Baltimore, Maryland  
Maryland State Department of Education; Baltimore, Maryland  
Miami Public Schools; Miami, Florida  
M.I.C.E. Program, Department of Public Health; Concord, New Hampshire  
Middletown High School North; Middletown, New Jersey  
Missouri School for the Blind; St. Louis, Missouri  
National Park Public School; National Park, New Jersey  
National Technical Institute for the Deaf; Rochester, New York  
Nebraska School for the Visually Handicapped; Nebraska City, Nebraska  
New Jersey Commission for the Blind and Visually Impaired; Newark, New Jersey  
New York Institute for the Blind; Bronx, New York  
Orientation Center for the Blind; Albany, California  
Orleans Parrish Schools; New Orleans, Louisiana

Parkview School for the Blind; Muskogee, Oklahoma  
Perkins School for the Blind; Watertown, Massachusetts  
Region IV Education Service Center; Houston, Texas  
Rehabilitation Center; Denver, Colorado  
Reilly Elementary School; Austin, Texas  
Royal Palm School; West Palm, Florida  
San Diego Unified School District; San Diego, California  
San Juan Unified School District; Carmichael, California  
South Carolina Commission for the Blind; Charlestown, South Carolina  
South-West Regional School for the Deaf and the Blind; Mobile, Alabama  
Texas Commission for the Blind; Austin, Texas  
Vista Unified School District; Vista, California  
W. Ross MacDonald School; Brantford, Ontario, Canada  
Wantage School; Sussex, New Jersey  
Western Pennsylvania School for Blind Children; Pittsburgh, Pennsylvania  
Wisconsin School for the Visually Handicapped; Janesville, Wisconsin

Consultants during FY 1984

Beetz Notation Graph Survey

Teacher Evaluators:

- Mr. Mark DeMareo, Music Teacher, Middletown High School North, Middletown,  
New Jersey
- Mr. Ted Hage, Special Education Teacher, Eagle Mountain-Saginaw School, Fort  
Worth, Texas
- Mr. Dave Hirsch, Music Teacher, Burlington County Special Services, Mt. Holly,  
New Jersey
- Ms. Stephine Kuehn, Itinerant Teacher, Crittenden County Elementary School,  
Marion, Kentucky
- Ms. Phyllis Lippincott, Music Teacher, National Park Public High School,  
National Park, New Jersey
- Ms. Nancy Moody, Instrumental Music Teacher, Wantage School, Sussex, New  
Jersey
- Ms. Trina Pender, Music Teacher, Royal Palm School, West Palm, Florida

Developing Vision through Lights

Teacher Evaluators:

- Ms. Judy Goodrich, Director, Deaf-Blind Curriculum Adaptation Project,  
Lexington, Kentucky
- Mr. Richard King, Teacher, South Carolina Commission for the Blind, Charleston,  
South Carolina
- Mrs. Pam Matheson, Teacher, Howard County Public Schools, Columbia, Maryland
- Ms. Maxine Papermaster, Director, Center for Blind Children, Milwaukee,  
Wisconsin
- Mrs. Phyllis Sells, Director, Duncanwood School, Nashville, Tennessee
- Mrs. Nancy Smith, Preschool Teacher, Wisconsin School for the Visually  
Handicapped, Janesville, Wisconsin
- Mrs. Jean Turzanski, Teacher, Howard County Public Schools, Columbia, Maryland



### Diagnostic Test of Grade 2 Literary Braille

Mrs. Freda Henderson, Curriculum Director (Retired), Tennessee School for the Blind, Nashville, Tennessee

Dr. Sally Mangold, Assistant Professor, Special Education, San Francisco State University, San Francisco, California

Dr. Rosemary O'Brien, Supervisor, Vision Services Center, Montgomery County Public Schools, Bethesda, Maryland

Mrs. Alice Queensen, Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Dr. Earl Rankin, Professor, Department of Curriculum and Instruction, University of Kentucky, Lexington, Kentucky

Dr. Evelyn Rex, Coordinator, Program of Visually Handicapped, Illinois State University, Normal, Illinois

Dr. Mila Truan, Consultant, Tennessee School for the Blind, Nashville, Tennessee

### Fine Motor Development Materials

#### Teacher Evaluators:

Ms. Judy Goodrich, Director, Deaf-Blind Curriculum Adaptation Project, Lexington, Kentucky

Mr. Richard King, Teacher, South Carolina Commission for the Blind, Charleston, South Carolina

Mrs. Pam Matheson, Teacher, Howard County Public Schools, Columbia, Maryland

Mrs. Phyllis Sells, Director, Duncanwood School, Nashville, Tennessee

Mrs. Nancy Smith, Preschool Teacher, Wisconsin School for the Visually Handicapped, Janesville, Wisconsin

Mrs. Jean Turzanski, Teacher, Howard County Public Schools, Columbia, Maryland

### Fundamental Mathematics Concepts for Physically Handicapped Students

Mrs. Sandra Albrecht, Early Childhood Specialist (formerly with the Florida School for the Deaf and the Blind), St. Augustine, Florida

Mr. Daniel Burch, Communications Specialist, Independent Living Center for the Deaf, New Orleans, Louisiana

Mr. Anthony Evancic, Educational Supervisor, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Dr. E. Glenadine Gibb, Professor of Mathematics, The University of Texas, Austin, Texas

Dr. Harry Lang, Associate Professor, National Technical Institute for the Deaf, Rochester Institute of Technology, Rochester, New York

Mr. Richard Morris, Supervisor of Multihandicapped Blind, San Diego Unified School District, San Diego, California

Dr. Evelyn Neufeld, Associate Professor, School of Education, San Jose State University, San Jose, California

Dr. Ann Swanson, Chairman, Department of Physical Science, Edgewood College, Madison, Wisconsin

Dr. Tuck Tinsley, III, Principal and Mathematics Specialist, Florida School for the Deaf and the Blind, St. Augustine, Florida

Mr. Jerry Vandergrift, Educational Supervisor, Florida School for the Deaf and the Blind, St. Augustine, Florida

Teacher Evaluators:

Ms. Lea Antonucci, Deaf-Blind Program, Albert Schweitzer School, San Diego, California

Ms. Shelly Barron, Deaf-Blind Program, Albert Schweitzer School, San Diego, California

Ms. Carol Crook, Deaf-Blind Program, Perkins School for the Blind, Watertown, Massachusetts

Ms. Wendy DeLeon, Multihandicapped Blind Program, Laurel Ridge Elementary School, Decatur, Georgia

Ms. Sandi Driben, Multihandicapped Blind Program, Florida School for the Deaf and the Blind, St. Augustine, Florida

Ms. Melba Diane Fisher, Multihandicapped Blind Program, South-West Regional School for the Deaf and the Blind, Mobile, Alabama

Ms. Katherine Futryk, Multihandicapped Blind Program, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Ms. Karen Gauthier, Harahan Elementary School, Harahan, Louisiana

Ms. Cinda Hubbard, Multihandicapped Blind Program, Fairmont School, El Cerrito, California

Ms. Karol Jump, Vista Unified School District, Vista, California

Ms. Debra Leff, Reilly Elementary School, Austin, Texas

Ms. Diane McGarity, Multihandicapped Blind Program, Helen Keller Center,  
Alabama Institute for the Blind, Talladega, Alabama

Ms. Lee Ann Meadows, Deaf-Blind Program, Atlanta Area School for the Deaf,  
Clarkston, Georgia

Ms. Cyral Miller, Reilly Elementary School, Austin, Texas

Ms. Angelyn Mills, Multihandicapped Blind Program, E. B. White School, New  
Orleans, Louisiana

Ms. Kathleen Morris, Multihandicapped Blind Program, Albert Schweitzer School,  
San Diego, California

Ms. Daisy Roberson, Deaf-Blind Program, Helen Keller Center, Alabama Institute  
for the Deaf and the Blind, Talladega, Alabama

Ms. Mary Frances Ross, Multihandicapped Blind Program, South-West Regional  
School for the Deaf and Blind, Mobile, Alabama

Ms. Elaine Spector, Ross Elementary School, San Diego, California

Mrs. Alice Stabinsky, E. D. White School, New Orleans, Louisiana

Ms. Clare Sullivan, Deaf-Blind Program, Atlanta Area School for the Deaf,  
Clarkston, Georgia

Mrs. Bea Teal, Barrett Elementary School, Birmingham, Alabama

Ms. Larinda Wagenhouser, Kaiser Elementary School, Houston, Texas

Ms. Laurie Wasserman, Deaf-Blind Program, Perkins School for the Blind,  
Watertown, Massachusetts

Ms. Marsha Williams, Multihandicapped Blind Program, Vista Unified School  
District, Vista, California

Ms. Charlotte Wood, Multihandicapped Blind Program, Hilltop Elementary School,  
Chula Vista, California

Light Box Materials: Level II

Teacher Evaluators:

Ms. Carol Danielson, Dallas Services for Visually Impaired Children, Dallas,  
Texas

Ms. Bernice Ferdinand, E. D. White Elementary School, New Orleans, Louisiana



Ms. Laura Gray, Delta Gamma Foundation, St. Louis, Missouri

Ms. Ellen Perry, Leawood Elementary School, Columbus, Ohio

Ms. Ela Shacklett, Children's Special Education Center, Kansas City, Missouri

Ms. Melanie White, Dallas Services for Visually Impaired Children, Dallas,  
Texas

Ms. Martha Wyrsh, Children's Special Education Center, Kansas City, Missouri

#### Materials for Adolescent Multihandicapped Visually Impaired Students

Ms. Linda Bannon, Teacher, Washington State School for the Blind, Vancouver,  
Washington

Dr. Lars Guldager, Superintendent, Oak Hill School, Hartford, Connecticut

Mr. Kevin Lessard, Assistant Director, Perkins School for the Blind, Watertown,  
Massachusetts

Ms. Betsy McGinnity, Teacher, Perkins School for the Blind, Watertown,  
Massachusetts

#### Patterns Power Library

Miss Freda Henderson, Curriculum Director (Retired), Tennessee School for the  
Blind, Monkton, Maryland

Mrs. Alice Queensen, Teacher (Retired), Missouri School for the Blind, St.  
Louis, Missouri

Mrs. Deanne Scoggins, Teacher, Kentucky School for the Blind, Louisville,  
Kentucky

#### Read Again

Ms. Joan N. Binder, Braille Teacher, The Hadley School for the Blind,  
Winnetka, Illinois

Ms. Pam Cannon, Teacher, Atlanta Area Services for the Blind, Atlanta, Georgia

Ms. Margie Cernitz, Teacher, Montgomery County Schools, Bethesda, Maryland

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago,  
Chicago, Illinois

Ms. Marietta Howington, Teacher (Retired), Tennessee School for the Blind,  
Nashville, Tennessee

Ms. Marjorie Miller, Assistant Director, Professional Services, Chicago  
Lighthouse for the Blind, Chicago, Illinois

Dr. Grace Napier, Professor of Special Education, College of Education,  
Division of Professional Teacher Education, University of Northern Colorado,  
Greeley, Colorado

Dr. Roseann Reid, Chairman, Education Department, Greater Pittsburgh Guild for  
the Blind, Bridgeville, Pennsylvania

Technological Needs and Applications

Mrs. Eileen Young, Instructor, Spalding University and University of Louisville,  
Louisville, Kentucky

Research and Developmental Personnel for FY 1984

|                       |                                |
|-----------------------|--------------------------------|
| Barth, John, PhD      | Research Scientist             |
| Bensinger, Sharon, BS | Research Assistant             |
| Bolin, Gene           | Library Clerk/Clerk Typist     |
| Caton, Hilda, EdD     | Research Scientist (part time) |
| Davis, Gary           | Mechanical Designer*           |
| Duckworth, Bill, MS   | Librarian/Research Scientist   |
| Franks, Frank, EdD    | Research Scientist             |
| Frere, Suzette, BA    | Research Associate             |
| Glass, Robert, MEd    | Research Associate             |
| Moore, Sheri, MS      | Research Scientist             |
| Morris, June, MA      | Director                       |
| Pester, Eleanor, MS   | Research Associate             |
| Poppe, Tom            | Model and Pattern Maker*       |
| Walsh, Jeannette      | Secretary                      |
| Willis, Deborah, BA   | Research Associate             |

\*Design and Development Section



Publications during FY 1984

- Barth, J. L. (1983). The development of fundamental skills in tactile graph interpretation: A program for braille readers: Final report. Louisville, KY: American Printing House for the Blind. [Project No. 023CH10324; Grant No. G008001878]
- Barth, J. L. (1983). Factors affecting line tracing in tactile graphs. Journal of Special Education, 17, 215-226.
- Barth, J. L. (1983). Graphic literacy: A neglected area. In J. W. Wiedel (Ed.), Proceedings of the First International Symposium on Maps and Graphics for the Visually Handicapped. Washington, DC: Associate of American Geographers. Pp. 9-16.
- Barth, J. L. (1984). Incised grids: Enhancing the readability of tangible graphs for the blind. Human Factors, 26, 61-70.
- Franks, F. (1983). Applying educational research to maps and graphics for the visually handicapped. In J. W. Wiedel (Ed.), Proceedings of the First International Symposium on Maps and Graphics for the Visually Handicapped. Washington, DC: Association of American Geographers. Pp. 40-48.
- Hamp, E. P., & Caton, H. (1984). A fresh look at the sign system of the braille code. Journal of Visual Impairment & Blindness, 78, 210-214.
- Moore, S. B. (1984). A home-based media approach for developing critical skills in young visually impaired children: Final report. Louisville, KY: American Printing House for the Blind. [Project No. 446AH00143; Grant No. G008005184]

PATTERNS: THE PRIMARY BRAILLE READING PROGRAM

Third Reader Level:

- American Printing House for the Blind. (n.d.). Posttest criterion referenced to third reader level far away and long ago: Patterns, the primary braille reading program. Louisville, KY: Author. (student materials)
- American Printing House for the Blind. (n.d.). Review worksheets to accompany third reader level far away and long ago: Patterns, the primary braille reading program. Louisville, KY: Author. (student materials)
- American Printing House for the Blind. (n.d.). Worksheets to accompany third reader level far away and long ago: Patterns, the primary braille reading program. Louisville, KY: Author. (student materials)
- Caton, H., Pester, E., & Bradley, E. J. (1983). Far away and long ago, third reader level: Patterns, the primary braille reading program (3 vols. and a glossary). Louisville, KY: American Printing House for the Blind (student text)

Caton, H., Pester, E., & Bradley, E. J. (1983). Teacher's edition to accompany third reader level far way and long ago: Patterns, the primary braille reading program. Louisville, KY: American Printing House for the Blind.

Pester, E., & Modaresi, B. (1983). Teacher's edition review worksheets referenced to third reader level far way and long ago: Patterns, the primary braille reading program. Louisville, KY: American Printing House for the Blind.

Rankin, E. F. (1983). Teacher's edition posttest criterion referenced to third reader level far away and long ago: Patterns, the primary braille reading program. Louisville, KY: American Printing House for the Blind.

#### STANFORD ACHIEVEMENT TEST--FORMS E AND F

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering braille edition, primary 2. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering braille edition, primary 3. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering braille edition, intermediate 1. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering braille edition, intermediate 2. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering braille edition, advanced. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering braille edition, TASK--Stanford Test of Academic Skills--Levels 1 and 2. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering large type edition, primary 2. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering large type edition, primary 3. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering large type edition, intermediate 1. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering large type edition, intermediate 2. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering large type edition, advanced. Louisville, KY: American Printing House for the Blind.

Duckworth, B., & Cundiff, K. (1983). Stanford Achievement Test, Forms E and F: Directions for administering large type edition, TASK--Stanford Test of Academic Skills--Levels 1 and 2. Louisville, KY: American Printing House for the Blind.



Unpublished Paper Presented At A Meeting--FY 1984

Moore, S. B. (1984, June 24-28). Materials developed for home-based instruction of visually impaired children: Birth-24 months. Paper presented at the meeting of the First International Conference of the AAWB-AEVH Alliance; Nashville, TN.

Presentations and Workshops during FY 1984

Bensinger, S. G. (1984, June). Classroom materials for working with preschool children who are visually impaired. Fourth Annual Conference for Agencies Serving Developmentally Delayed Children. University of the South, Sewanee, TN.

Caton, H. R., & Pester, E. J. (1983, July). Patterns at work. North Central Region Association for the Education of the Visually Handicapped Conference, Lincoln, NE.

Franks, F. L. (1984, March). FOCUS workshop: Academic edition. California Transcribers and Educators of the Visually Handicapped, San Diego, CA.

Franks, F. L. (1984, March). FOCUS workshop: Multihandicapped and deaf-blind editions. California Transcribers and Educators of the Visually Handicapped, San Diego, CA.

Franks, F. L., & Glass, R. D. (1984, March). FOCUS workshop: Academic edition. Methods and materials in the education of the visually handicapped, Department of Education, University of Louisville, Louisville, KY.

Frere, S. (1984, April). Comprehensive programs for the visually handicapped: Low vision training. Council for Exceptional Children, Washington, DC.

Glass, R. D. (1984, May). FOCUS workshop: Academic edition. New Jersey Commission for the Blind, Newark, NJ.

Glass, R. D. (1984, April). FOCUS workshop: Academic edition. Spring meeting of the Texas Education Agency Education Service Center Consultants for the Visually Handicapped, Austin, TX.

Moore, S. B. (1983, August). Workshops (3) on APH materials for multihandicapped visually impaired students. Conway Human Developmental Center, Conway, AR.

Moore, S. B. (1984, June). Presentation of materials developed for home-based instruction of visually impaired children: Birth-24 months. The First International Conference of the AAWB-AEVH Alliance, Nashville, TN.

Morris, J. E. (1984, April). Comprehensive programs for the visually handicapped: Social studies. Council for Exceptional Children, Washington, DC.

Morris, J. E. (1984, March). From taboos to technologies. California Transcribers and Educators of the Visually Handicapped, San Diego, CA.

Pester, E. J. (1983, August). Patterns workshop. Indiana School for the Blind, Indianapolis, IN.

Pester, E. J. (1983, November). Patterns workshop. New Jersey Commission for the Blind, Newark, NJ.

Pester, E. J. (1984, April). Comprehensive programs for the visually handicapped: Braille reading (Readiness). Council for Exceptional Children, Washington, DC.











DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES  
FISCAL 1985

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For The Blind  
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During the 1985 fiscal year, research and development activities have progressed, generally, as planned. As always, projects reported represent varying stages; some are starting, some are continuing, some are at the point where the development is completed but are moving through the production process, and some are completed. A project is considered finished when the final report for the project is written and the first production run has been achieved. Research staff works closely with production staff through the first runs of all new products. Subsequently, as changes in materials or production processes are required, again research staff is involved.

The current report shows two shifts in emphasis of the research and development program. A major effort is now underway in the area of microcomputer applications. The goals are for the Printing House to provide the support materials needed for training visually handicapped students to use microcomputers and to provide software for use with this educational tool. To help accomplish these goals, an expert programmer, Larry Skutchan, recently joined the research and development staff. If interest in microcomputer applications for educational purposes continues, the Printing House will have an entirely new product line to support it. Simultaneously, a decision was made to discontinue work on the development of new special materials addressing mathematics, science, and social studies other than those resulting from microcomputer software applications. Sales for such materials have been extremely slow and teachers serving visually handicapped students in local school programs report there is no time to provide the special training in these areas which the American Printing House's special products make possible.

As indicated in previous annual reports, Gary Davis and Tom Poppe, of the Department of Educational Research's Design and Development Section, are key people in the development of all new nonverbal materials. It is they who are responsible for the experimental materials, the production design and determining the manufacturing process, and, ultimately, some of the production tooling. The interface between the idea and the product they provide is a primary factor in the wide array of exciting new products released in recent years by the American Printing House for the Blind.



Following is a list of new products resulting from the Department's efforts:

New Products Released during FY 1985

*Beginnings: A Practical Guide for Parents and Teachers of Visually Impaired Babies* [print guidebook]

Braille Unit Recognition Battery: Diagnostic Test of Grade 2  
Literary Braille

Bright Sights: Learning to See

FOCUS in Mathematics:

Academic Program

Deaf-Blind Program

Multihandicapped Program

Large type editions of microcomputer related manuals:

*Apple II DOS User's Manual*

*Apple IIe Owner's Manual*

*Echo II Speech Synthesizer*

*The Random House Book of Computer Literacy*

Meterstick

*Patterns Library Series:*

Second Reader Level

Third Reader Level

Playing the Crucial Role in Your Blind Child's Development [slide-cassette program]--with Spanish supplement

Tangible Graphs

New Products To Be Released Early in FY 1986

Basic Reading Rate Scale

Braille editions of microcomputer related manuals:

*Apple II DOS User's Manual*

*Apple IIe Owner's Manual*

*Echo II Speech Synthesizer*

*The Random House Book of Computer Literacy*

Light Box Materials: Level II

*The World Book Year Book 1984-1985, Recorded Edition*

Following are brief descriptions of research and development projects underway during the 1985 fiscal year and planned for the 1986 fiscal year. They fall into nine categories: early childhood and multihandicapped, pre-vocational, low vision, braille, mathematics, tactile graphics, educational measures, microcomputer applications, and other.

## Early Childhood and Multihandicapped

### Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Purpose: To develop a set of materials, targeted for professionals and parents, to assist in developing critical skills in visually impaired children, birth-24 months

Work completed during FY 1985. The three components of the Home-Based Media project have continued to be refined as research staff work with production and editorial personnel. Each of the three components, including a manual/guidebook, slide-cassette program of learning activities, and an electronic sound-producing sensory mat, has been specifically developed for the professional or parent working with visually impaired children, birth-24 months.

The slide-cassette program, entitled "Playing the Crucial Role in Your Child's Development," was prepared for production after final revisions were made to both the script and the accompanying slides. A set of revised master slides was made, for use in obtaining production bids. The master cassettes, recorded in both English and Spanish, were also readied and turned over to production personnel. The slide-cassette program has completed the manufacturing process and is available for sale.

The manual/guidebook, entitled *Beginnings: A Practical Guide for Parents and Teachers of Visually Impaired Babies*, has been professionally edited and revised as deemed necessary. Research staff has worked closely with both editing and layout/design professionals on this task. Proofreading was undertaken at various stages, assuring that the proper content remained intact. In addition, pictures were secured and positioned in appropriate places to enhance the written content of the manual. The manual is completed and available for sale.

A final report, detailing the entire Home-Based Media project, was written and printed. This report provides a sequential presentation of all aspects of the project--from the background and related research through the final production specifications. Sheri Moore has continued to coordinate these phases of the Home-Based Media project.

Work planned for FY 1986. The sound-producing sensory mat, designed to enhance the young child's motor and auditory development, continues in the process of being further refined in preparation for production. The continuing and fast-paced changes in microelectronics have necessitated exploring additional materials and techniques, more sophisticated than those used in the field evaluation mat. A number of electronics vendors will be contacted, in an attempt to provide consumers with a technologically up-to-date and cost effective sensory mat product. In these tasks, research staff has worked closely with both American Printing House production and electronics departments. Sheri Moore will direct this work.

## Materials for Adolescent Multihandicapped Visually Impaired Students

Purpose: To develop and evaluate a set of materials useful in meeting identified needs of adolescent multihandicapped students who have achieved basic skill levels

Work completed during FY 1985. A series of materials development projects has been recommended by consumers for meeting the needs of the older multihandicapped visually impaired student who has achieved basic skill levels. To determine the most needed materials, research staff met with 25 direct service professionals from both education and rehabilitation programs. These professionals were asked to prioritize materials development projects in the areas of sensory skill development, daily living skills, life and community living skills, survival skills, and self-help skills. Each professional talked with research staff about specific materials development needs for this population and also completed a questionnaire. These data were compiled and analyzed, resulting in the delineation of two major projects. The project receiving highest priority would involve the development of an adolescent level kit of sensory materials. Such an adapted, "older" version of the American Printing House for the Blind's Sensory Stimulation Kit would be targeted towards lower functioning multihandicapped visually impaired students with chronological ages of 10-18. This set of materials would attempt to develop and reinforce basic sensory processes using age-appropriate materials. Consideration would be given in the conceptualization of this project to the potential use of these materials in both training and leisure skill development applications. Input from ex officio trustees indicated an interest in incorporating self-activated materials within the items selected. Such materials will be included and evaluated in field testing.

A comprehensive set of materials received slightly lower priority. These materials would include items to develop daily living skills, self-help skills, as well as life, community, and survival skills. Materials would be developed in component or modular fashion, so that specific learning units could be selected and taught as needed. A variety of tangible materials, along with written and recorded support materials, will be considered in the development of these materials. Examples of specific skills which the professionals surveyed deemed appropriate for this set of materials include:

1. Building independence and self-sufficiency in daily living and personal care areas, such as dressing, selecting clothes, hair care, bathing, grooming, make-up application, shaving, menstruation, etc.
2. Community living and life skills, such as greeting people, street behavior, table manners, ordering in a restaurant, paying for a purchase in a store, using public transportation, preparing simple food items, doing laundry, use of leisure time, sex education, development of work habits and behaviors, etc.



3. Basic survival skills such as signs/words for bathroom (men and women), exit sign, fire alarm, in/out, stop sign, danger, keep out, as well as situational role playing of occurrences such as reporting an emergency by phone, getting off at the wrong bus stop, asking for assistance in the grocery store, etc.

Work planned for FY 1986. Work will proceed on developing these materials for the adolescent multihandicapped visually impaired student. Initially, extensive literature searches and commercial materials reviews will be conducted as a sound basis for material and product development. Sheri Moore will direct this project along with Suzette Frere.

#### Fine Motor Development Materials

Purpose: To evaluate production modifications to materials designed to assist young visually impaired children in the development of fine motor skills, birth-48 month level

Work completed during FY 1985. The fine motor materials, designed to assist visually handicapped students functioning at a birth-36 month level, consist of eight modular units. Each unit is designed so as to present a unique fine motor function, which can be developed or enhanced with the assistance of these materials. Examples of fine motor functions that can be developed through use of these materials include: pincer grasp, wrist rotation, grasp/release, palmar grasp, reaching, finger manipulation/coordination, eye-hand coordination, thumb opposition to grasping, searching technique, and so on.

The materials were evaluated in six educational programs serving infant, preschool, and multihandicapped visually impaired children. Evaluating teachers provided a great deal of information about the fine motor materials, including such things as the developmental level of students for which they are most useful, a comparison with other fine motor development materials previously used, student relative interest in the Printing House materials, and a durability, safety, usefulness, and skill index rating for each of 10 modular units. All data gathered from evaluating teachers were compiled and analyzed. As a result, 2 of the 10 units were considered unsatisfactory and eliminated. Other minor modifications were detailed for remaining units to enhance their usefulness. The revisions have been made by the Design and Development Section of the Department of Educational Research. Following these revisions, the fine motor materials have been readied for production. A report detailing several possible production methods has been prepared by Gary Davis. Sheri Moore has directed this project. Gary Davis has supplied a plan for production.

Work planned for FY 1986. Consideration will be given to the report detailing possible production methods to determine the most cost effective and efficient production system. Simultaneously, the accompanying teacher's guide and activity cards will be reviewed and edited prior to printing. Sheri Moore and Gary Davis will work cooperatively on this final phase of the project.

### Early Childhood Educational Materials Needs Assessment Meeting

Purpose: To develop a listing of educational materials, generated by consumers, needed to assist in the development of skills for blind and visually impaired infants and preschool children

Work planned for FY 1986. A meeting of teachers and related professionals working with blind and visually impaired infants and preschoolers will be conducted to determine needed educational materials for this population. An initial such meeting will take place in conjunction with the 11th International Symposium on Infant and Preschool Blind and Visually Impaired Children in Almagordo, New Mexico in October 1985. Sheri Moore will direct the needs assessment meeting.

### Prevocational

#### Prevocational Skills Development Materials II

Purpose: To develop a prevocational skills kit that will utilize assessment and programming strategies which will include activities to develop work habits and skills needed in the vocational setting

Work completed during FY 1985. A literature and existing materials review was conducted to ascertain developments in the area of prevocational training since 1979. An existing review of this information was done up to that time for the *Prevocational Skills Development Materials* kit presently offered by the American Printing House for the Blind.

A meeting was held with a committee selected for their expertise with school aged and adult visually handicapped. In the 2-day meeting, emphasis was placed on existing programs that emphasized the goals of this project. Some of the programs suggested were thought to be useful for national distribution by the participants, if modified. With these recommendations, and guidelines provided by the committee, a review of each of the suggested programs was carried out. Only one, *The Austin Work Skills Evaluation*, was thought to be a viable approach to programming for visually handicapped students in the area of prevocational training. This program is much more than an assessment tool in that evaluation leads to an assortment of training activities at two levels of development. The activities are quite thorough in their preparation of the student for work indoctrination and the learning of various work skills that lead to transferable skills.

In addition, extremely useful tangible apparatus are suggested that, while difficult to produce locally, could be easily and well produced by the American Printing House for the Blind. These tangibles have been designed by Gretchen Stone and Bill Duckworth. The drawings were executed by Tom Poppe.

Work planned for FY 1986. The written materials and accompanying tangibles will be developed and evaluated in the field. Subjects for the study will be enrolled in programs which have a prevocational component. They will have at least one handicapping condition in addition to legal blindness. The target age for this field testing will be age 10 and higher.

Data collected will include information on the manipulability, durability, safety, appropriateness, interest level of the students relative to similar materials, effectiveness in teaching identified skills, and the value of the accompanying written materials. Suzette Frere and Tom Poppe will assist Bill Duckworth on this project.

### Low Vision

#### Bright Sights: Learning to See (Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students, Birth-36 Months)

Purpose: To develop a kit of materials, divided into two levels of difficulty (sensory and perceptual), useful in assisting visually impaired students functioning at a birth-36 month level to learn to use remaining vision

Work completed during FY 1985. Research staff has continued working closely with both production and editorial personnel on the Bright Sights materials. As these items have gone through the production process, research staff assisted with the acquisition of tangible fluorescent materials, developed specifications and tolerances for manufactured and sewn items, and worked with editorial staff on the teacher's guide. The teacher's guide, detailing activities and guidelines for using the Bright Sights materials, was edited, followed by layout and design work. In addition, staff worked with marketing personnel in developing promotional material for Bright Sights.

A complete set of Bright Sights production materials was taken to U.S. Testing Laboratories in Hoboken, New Jersey, for product safety testing. All items passed the stringent qualifications for approval at the birth-36 month functional level.

The Bright Sights materials have completed the production process and are now available for consumers. Sheri Moore coordinated this phase of the Bright Sights project.

Work planned for FY 1986. A final report, detailing all aspects of project development, will be written. Sheri Moore will perform this task.



### Light Box Materials Level II

Purpose: To develop a set of materials and related activities to use with the Light Box to facilitate the development of residual vision in children functioning from 3-5 years of age

Work completed during FY 1985. As planned, Light Box Materials Level II were in the process of being produced. During this time a number of improvements were made on the materials used to construct the prototypes. Colored lucite pegs and 1-inch cubes replaced the mocked-up pegs, which used colored art film over plastic. The 1/16 inch thick ABS plastic templates, stencils, and cut-outs are now constructed of 3/8 inch thick foam-backed black Kydex. These are easier to trace around, hold the 1-inch cubes more securely, and adhere to the Light Box surface in upright positions. Parquetry pieces have been improved: they are slightly thicker for easier handling. All transparent colored pictures of geometric shapes and familiar objects were silk-screened in-house using more vivid colors than used with the prototypes. Prototype "sticks" were made from masonite strips. The "sticks" made for production are 3/8 inch square black plastic rod; these are more durable, easier to manipulate, and less expensive to mass-produce. Finally, a clear flexible vinyl sheet was added to the kit. Designed to be spread over the Light Box work surface, it aids in keeping parquetry pieces, silk-screened pictures, and other kit items from slipping on the surface as the child works. It also holds items in place in semi-upright positions, providing a better visual display of the task.

Packaging was designed for the Level II kit. Four heavy plastic storage boxes hold pegs, cubes, parquetry pieces, and sticks. A ring binder with vinyl pages holds silk-screened pictures in "see-thru" pockets. Storage boxes, binder, remaining kit items, and the guidebook fit in a flat zippered case with rigid sides and bottom.

In addition to improvements made to the kit's hardware, refinements were made to the software. The guidebook was revised following the field evaluation: some activities were reordered and new activities suggested by evaluators were incorporated. The final copy of the *Activity Guide* for Level II was marked for typesetting and illustrations were provided. The Activity Sheets, a set of worksheet masters accompanying the kit, were expanded. Camera-ready art was prepared for each of the 95 sheets. Suzette Frere was responsible for this project.

### Light Box Materials Level III

Purpose: To develop a set of materials and related activities to use with the Light Box to facilitate the development of residual vision in children functioning from 4-6 years of age

Work completed during FY 1985. As planned, rough prototypes of the items proposed for the third level of Light Box Materials were constructed in mid-August of 1984. These included over 120 2 X 2 inch colored transparent pictures featuring common environmental objects, objects with differing details and missing parts, letters, and numbers. Various game "mats"



were constructed from clear vinyl. These featured pockets to hold the 2 X 2 inch cards in various configurations for playing Lotto, Bingo, Pictured Dominoes, "Concentration," and 20-square "board" game requiring the student to match and identify pictures, letters, and numbers. Picture puzzles, logic sequence cards, and two large scenes containing multiple objects completed the set.

Two consultants were contacted to review the materials firsthand with students in their area. A research staff person was present for the review and evaluation. Consultants reacted favorably to the graphics, suggesting the thickness of the lines be increased and some pictures be enlarged slightly. They suggested additions to the graphics and requested a clock face be devised for teaching an understanding of spatial relationships in addition to more traditional activities related to telling time. When asked whether they would prefer game mats constructed of clear vinyl or game trays thermoformed of clear plastic, they selected trays.

Additional artwork was completed and modifications to the existing graphics were made in accordance with the consultants' recommendations. An analysis was made of the number of cards and number of duplicates needed to play all kit games at different levels of difficulty (i.e., pictured objects of the same color but dissimilar shape, pictured objects of similar shape and color, black line drawings of similar shape, etc.). Point sizes for all lines were determined and colors were specified in detail for each piece of artwork. Camera-ready artwork was made from the original drawings and accompanying specifications. Various substrate material were considered for the graphics; .015 inch thick rigid vinyl, matte on one side, was preferred. Silk-screening the graphics promised excellent registration and the opportunity to use the preferred thickness of vinyl; therefore, it was selected as the method of production over off-set printing processed. To complete preparation of the graphics, a full lay-out of all Level III artwork was designed. Color separations were made in-house. Preparation of screens and production of six sets of prototypes was completed by a company specializing in this type of work. Prototypes for the kit's thermoformed trays and game spinner were designed and constructed in-house by American Printing House staff.

A sequence of skills already proposed for the Level III Materials was expanded; a number of subskills were delineated. Specific written activities were devised and organized based upon the skill sequence, which covers nine major areas: eye-hand coordination (prewriting); discrimination and association; spatial relationships; recognition/identification; sequencing; visual memory; figure-ground relationships; visual closure; and part-whole relationships.

The pretest-pretest-posttest design for the evaluation of the Level III Materials was devised with the assistance of Sheri Moore, who is responsible for this segment of the project. Subjects participating in the field evaluation included 31 partially sighted and legally blind students with residual vision, ages 4, 5, and 6 years. Each subject was administered a specially designed pretest at the beginning of the study. The pretest was repeated in 4 weeks without intervention of any kind. Following the second administration of the test, intervention was provided in the form of the Level III

Materials and activities, which were used with subjects for 4 weeks. At the end of the intervention period, the test was given a third time. Comparison of the student's performance on the three occasions the test was given will indicate effectiveness of the training materials. The 39-item test was designed based upon the skills addressed by the Level III Materials; several items being included from each of the nine major skill areas.

In addition to the collection of student data, teachers using the materials with subjects completed a general questionnaire regarding the materials. Results of their evaluations indicate general approval of the graphics, tangible items, and written activities. Evaluators expressed satisfaction with the quality of the artwork and silkscreening. Some materials, such as the large picture scenes and puzzles, drew especially favorable comments from evaluators. A number of evaluators remarked that the durability of the thermoformed trays should be improved; a change in plastic was already planned to eliminate cracking and warping of the molded trays. All evaluators indicated the activities were clearly written, properly sequenced, and appropriate for students functioning 4 to 6 years of age. When asked to rate various items and games in terms of their potential value in training residual vision, 79% of the evaluators rated the item or task "highly useful," 18% of the item/task was rated "moderately useful." Several teachers commented upon the variety of activities provided: "I particularly appreciate the variation and flexibility which allows for changing cards and thus varying games according to abilities. I'm amazed when I consider the span of activities I can conduct with all my visual children each day."

Following an analysis of teacher questionnaire results, revisions to the tangibles were specified. No changes in the existing graphics were warranted, however 12 4 X 4 inch graphics showing objects and objects with missing detail were added. A production document completely specifying the materials to be included with the product was then prepared.

Work planned for FY 1986. Revision to the Level III written activities and their overall sequence will be made based upon a thorough analysis of student data obtained during the field evaluation. A final copy of the guidebook will be given to the Editorial Department for typesetting. The Level III Materials received production approval in May 1985; therefore, project staff will work closely with production personnel as methods and materials for mass-producing each item are designed and selected. Suzette Frere has been responsible for this project. Sheri Moore and Bob Glass have assisted in the evaluation phase of the project.

#### Developing Vision through Lights

Purpose: To identify a set of light related materials that prove useful in developing remaining vision in visually impaired students functioning on a birth-36 month level

Work completed during FY 1985. A set of 12 light-producing materials was included in the final evaluation phase of this project. These materials were evaluated by professionals working with multihandicapped and visually



handicapped children functioning at the birth-24 month developmental level. Evaluating teachers and therapists rated the materials in a variety of areas, including visual skills to be developed using the light materials; activities useful with the lights; durability, safety, and potential usefulness of each light; positive and negative characteristics of each light; suggested modifications/revisions; other materials useful for developing remaining vision in this population; and so on. Based on these evaluations, revisions and modifications were determined for the light materials after all data were compiled, posted, and analyzed. Additional revisions were detailed for the accompanying teacher's guide, which includes guidelines and activities for each light item.

Work was also undertaken to develop a set of final specifications for the Developing Vision through Lights materials and accompanying teachers' guide. In addition, a production document was readied. Sheri Moore has been responsible for this project, assisted by Sharon Bensinger.

Work planned for FY 1986. Work will continue to ready the light-producing materials for production. This will necessitate close coordination with the Department's Design and Development Section. A final expert review will be conducted on all of the accompanying activities and guidelines for teachers. In addition, a report summarizing total product development will be readied. This work will be conducted by Sheri Moore.

#### Identification of Research Needs and Low Vision

Purpose: To review and evaluate the existing research on low vision and to identify current research needs in low vision

Work completed during FY 1985. A list of workable descriptors for locating research on low vision was identified and used to conduct a computer search of the literature. Abstracts from this search have been evaluated according to suitability for the purpose of this study and completeness and classified by topics.

Work planned for FY 1986. When the review of the existing research is finished, the completed abstracts will be submitted to experts in the area of low vision as a basis for writing "think pieces" on the topic of research needs in low vision. Eleanor Pester is responsible for this project. She was assisted this year by Sharon Bensinger.

#### Braille

#### Patterns: The Primary Braille Reading Program (Beginning Braille Reading Series)

Purpose: To develop a set of beginning reading materials specifically designed to minimize problems encountered by the beginning braille reader

Work completed during FY 1985. Work on the *Patterns Scope and Sequence Chart* was completed, and it is now available from the American Printing House.

Data from the Preprimer through Third Reader Level posttests continued to be solicited and have been dribbling in.

Work planned for FY 1986. Sufficient data from the Preprimer and Second Reader posttests will be analyzed. Additional data will still be solicited for the Primer, First Reader, and Third Reader posttests. Data will be used to refine the posttests when warranted. Hilda Caton and Eleanor Pester are responsible for this project. Eddy Jo Bradley is the directing editor.

### Patterns Library Series

Purpose: To develop sets of braille books which succeed the levels of *Patterns: The Primary Braille Reading Program* from Preprimer through Third Reader and which provide a means of practicing reading and discovering that reading can be fun

Work completed during FY 1985. The Second and Third Reader Levels of the *Patterns Library Series* were completed and are now available from the American Printing House for the Blind. Copyright applications for all five levels of the *Patterns Library Series* were submitted along with two production sets of each level of the materials.

Work planned for FY 1986. A final report for the *Patterns Library Series* project will be written. Eleanor Pester is responsible for this project. Eddy Jo Bradley is the directing editor.

### Read Again: A Program for Adventitiously (Recently) Blinded Persons

Purpose: To develop a set of materials designed to teach braille to persons who have lost their vision after initially learning to read print

Work completed during FY 1985. Part 1 of this program was prepared and sent to the consulting committee for review. Part 2 was written, prepared, and sent to the consulting committee for review. A report was written for the Read Again Survey which was conducted to determine reading interests and to identify most useful vocabulary for new braille users.

A meeting of the consultants was held in April to review the entire program and to decide on any necessary revisions. A need for wording and sequencing changes and the addition of practical reading applications was indicated.

Following this meeting, revisions were begun on the units introducing letters and numbers, and a study was made of the sequence used to introduce the braille code in seven programs for new braille users.

Work planned for FY 1986. The entire Read Again program will be revised as necessary and sent to the committee members once again for review. Where possible, committee members will try the program with their



clients. Another consulting committee meeting will be held to discuss the revised Read Again program. Hilda Caton and Eleanor Pester are responsible for the work on this project. Eddy Jo Bradley is the directing editor.

#### Braille Readiness Program

Purpose: To develop a comprehensive, sequentially organized braille readiness program

Work completed during FY 1985. A complete braille readiness program containing 80 lessons organized into meaningful units has been written and prepared for review.

Work planned for FY 1986. The complete readiness program will be placed at four field test sites for evaluation during the school year. Hilda Caton and Eleanor Pester are responsible for the project. Eddy Jo Bradley wrote the lessons.

#### Braille Language Program

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Work completed during FY 1985. Work officially began on this project in January. A computer search revealed very little relevant research. Three of the best selling print primary spelling programs and three of the best selling print primary English programs were reviewed. Further analyses of the print spelling programs were made by the project linguist. Braille spelling and language programs were also reviewed. Skills taught in *Patterns: The Primary Braille Reading Program* were analyzed and correlated with the spelling and English programs. Special editions of the word study, spelling, and language subtests of the *Stanford Achievement Test--Intermediate 1, Form E* were administered to 75 4th and 5th grade braille reading academic students in both day and residential schools throughout the country and returned to the American Printing House for scoring and analyses to identify deficit areas. Sample lessons on braillewriting were written and then revised based on a detailed task analysis. In June a meeting was held with the consulting committee to set specifications for the project.

Work planned for FY 1986. Specifications for the entire program will be finalized as drafts of the first two levels of the program materials are prepared. Materials on the first level will be reviewed and revised and then used in a pilot study of the program.

Hilda Caton and Eleanor Pester are responsible for this project. Eddy Jo Bradley is the directing editor. Eric Hamp is the linguist. The project is funded under a grant awarded to the American Printing House for the Blind by the federal Research in Education of the Handicapped Program's

Field Initiated Research competition, which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, U.S. Department of Education.

#### Identification of Research Needs in Braille

Purpose: To review and evaluate existing research on braille and to identify deficit areas in which additional research is needed

Work completed during FY 1985. The initial phase of this project was completed as a part of a project commissioned by the Braille Authority of North America. This phase included the reviewing and abstracting of studies related to the braille code only.

Subsequently, the project was expanded to include studies related to the braille code and studies related to the learning and reading of braille. Other studies which have a direct relationship to the development of Grade 2 braille were also included. The following activities were completed:

1. Searching of existing literature
2. Abstracting of articles identified through the search
3. Organizing the abstracts, chronologically, so that specific trends and/or gaps in research can be identified

Work planned for FY 1986. The evaluation of the studies, identification and prioritization of research needs, and writing of the report of the findings will be completed. Hilda Caton is responsible for the project. She was assisted by Sharon Bensinger.

#### Mathematics

#### Fundamental Mathematics Concepts for Physically Handicapped Students

Purpose: To develop instructional guides, with manipulative materials, to establish a content base for improving instruction in mathematics for blind students

Work completed during FY 1985. Development of these materials, supported through a grant from the National Science Foundation, was completed and a final report written. The Academic Kit and the Multihandicapped Program, both utilizing the same set of tangible aids, have been produced and are available from the American Printing House for the Blind. The Deaf-Blind Program, also utilizing the same set of tangibles, is complete and became available in April. Workshops and presentations on this program were given in Colorado, South Carolina, and in Kentucky at the annual meeting of the American Printing House for the Blind.

This project was funded under a grant awarded to the American Printing House for the Blind by the National Science Foundation. Frank Franks served as the project director. He was ably assisted by Bob Glass.

## Tactile Graphics

### Plate Embossing System for Tactile Graphics

Purpose: To develop a mechanical system to upgrade the quality of tactile graphic displays produced at the American Printing House for the Blind in a paper medium

Work completed during FY 1985. This system, enabling the embossing of highly legible point, linear, and areal symbols has been completed. The primary embossing machine was completed and has been used in the production of metal plates since early 1984. The companion machine, used for embossing point symbols, is ready to be moved into the stereograph department and be used in the general production of tactile graphics for production of braille publications. It has the capability of producing 20 selectable point symbols. All symbols produced by the Plate Embossing System for Tactile Graphics have been tested for tactual legibility and meet stringent criteria for such. Gary Davis was responsible for the design of the system and for its construction.

## Educational Measures

### Braille Unit Recognition Battery (Working Project title: Diagnostic Test of Grade 2 Literary Braille)

Purpose: To develop a comprehensive diagnostic test of the literary braille code

Work completed during FY 1985. The manual for the *Braille Unit Recognition Battery* was written during this period. Based on the field evaluation and resulting data, the manual is designed to enable the teacher to give the battery of the complete literary grade 2 braille code, analyze the results, and plan individual educational plans for any student tested. The test lends itself to checking the competency of a student of any age.

The battery and manual were completed and offered for distribution in May 1985. Bill Duckworth and Hilda Caton were responsible for this project.



Basic Reading Rate Scale (Part of working project title: Diagnostic Test of Grade 2 Literary Braille)

Purpose: To adapt a scale that could be field tested with the *Braille Unit Recognition Battery* for the purpose of gathering data on braille reading rate and, upon analyzing the test data, for the possibility of publishing the adapted scale for use within the field

Work completed during FY 1985. This adapted scale was given to the same 150 students as was the *Braille Unit Recognition Battery*. Upon analyzing the data of the field evaluation, it was found that the comparison of scores and other demographic information gave this test a credence in its agreement with other research done in the area of braille reading rate. This was using the scoring method of the print test. While the intention of administering this test was one of research, the field results indicated its feasibility for production and distribution.

Work planned for FY 1986. The technical manual needed to accompany this test will be written and a large type edition, test and manual, prepared. Bill Duckworth and Hilda Caton are responsible for this project.

Brigance Comprehensive Inventory of Basic Skills (tactile adaptation)

Purpose: To adapt an instrument that will inventory developmental and academic skills from prekindergarten to grade nine

Work completed during FY 1985. This inventory was proposed for adaptation by the Educational Measures Needs Committee, by individual trustees, by respondents to a survey of needs through *APH Notes*, and by the Publications Committee. Until recently it has been impossible to get permission from Curriculum Associates to develop a tactile supplement adaptation for this inventory. Recently, however, a tactile representation, with adapted administrative instructions, was prepared of two sections in order to explain to Curriculum Associates how adaptations are developed and used. The adaptation proposed would not take the place of the print materials but act as a supplement for those evaluative activities that are not suitable for the tactual learner. Permission to adapt was granted upon this presentation.

Work planned for FY 1986. The tactual format of this adapted supplement has been determined and work will begin on the adaptation in the fall of 1985. Bill Duckworth is responsible for this project.

Educational Measures Needs Meeting

Purpose: To identify and prioritize needs for educational measures by programs serving visually handicapped persons

Work planned for FY 1986. A committee will be convened to help identify educational measures not currently available for use with visually handicapped persons that are needed on a national basis. Prior to holding the meeting,



information will be solicited from major publishers of academic measures regarding their tests that are most widely used. Bill Duckworth will be responsible for determining these needs.

## Microcomputer Applications

### First Microcomputer Needs Meeting and Resulting Activities

Purpose: To identify and prioritize needs for educational materials to support use of microcomputers

Work completed during FY 1985. The first Microcomputer Needs Meeting was held August 2-3, 1984. The objectives of the meeting were to:

1. identify and sequence materials needs
2. plan or review keyboard familiarization materials
3. develop specifications for a beginning level program
4. consider specific editing questions
5. identify researchable questions related to this area

The first major activity of the meeting was to brainstorm problems and needs of legally blind students using microcomputers. Questions for discussion during the meeting included, "What approach should be taken in beginning to teach legally blind students about microcomputers?" "What should be the initial goal?" "What do low vision students need to accomplish this goal?" "What do braille readers need to accomplish this goal?" "What are some specific materials needed to accomplish this?" "Problems in accomplishing this?" "Are there already any specific pieces of software/manuals/programs aimed at accomplishing this goal for us to review?" (e.g., Muse Presents Know Your Apple/Apple Presents Apple/three modules developed at Peabody College under the direction of Samuel Ashcroft that cover an introduction in microcomputers, peripherals, and beginning programming/four modules prepared by the faculty of the Hadley School for the Blind which provide an introduction to microcomputers and access technology).

From this meeting a list of needs was generated and then categorized according to greatest needs, moderate needs, or least needs. The greatest needs identified were as follows:

1. Adapt Minnesota Educational Computing Consortium (MECC) software to make it voice (Echo) accessible.
2. Develop a basic familiarity program.
3. Add to computer literacy text [*The Random House Book of Computer Literacy*], a supplement on access technology. Consider module from Hadley School or Peabody College module.

4. Modify Spelling Program on Echo diskette.
5. Produce nontechnical manual for David Holladay's Braille Edit Program. Consider using manuals written by Phyllis Brunken or Frank Irzyk.

The list of greatest needs identified have all been addressed to some degree. Debbie Willis, assisted by Bob Glass, organized this meeting.

#### MECC Software

Purpose: To adapt for voice accessibility widely used educational software distributed by MECC

Work completed during FY 1985. A contact was made with Mr. Kent Kehrberg, the Director of Development at MECC. He was very receptive to having the American Printing House modify some of their software to make it voice accessible for legally blind persons. The next step was to identify the software to be modified.

Project staff reviewed several pieces of the MECC software and calls were made to various states inquiring about MECC software being frequently used. MECC was contacted regarding their best selling software. The American Printing House for the Blind software Evaluation Forms that had been completed by teachers using MECC materials were reviewed and a person located and consulted who had modified some of MECC's social studies software for voice (Echo) accessibility. Using input from the field, a decision was made to select and adapt MECC materials in the areas of English, mathematics, science, social studies, writing, and simple logic.

Work planned for FY 1986. Materials will be selected and adapted, one by one, from the curricular areas identified. The plans are for these to be adapted throughout the year with a goal of having 10-12 completed during the year. Debbie Willis and Bob Glass have been responsible for the identification of these materials and will prepare necessary documentation changes. Larry Skutchan will be responsible for the programming.

#### Development of a Familiarity Kit

Purpose: To develop a set of basic familiarization materials for use by teachers introducing the microcomputer to blind students/clients

Work completed during FY 1985. A Familiarization Program for the Apple IIe was developed. The program has four major components. They are:

1. A collection of computer parts which can be used to illustrate terms commonly incurred in discussions of the historical development of microcomputers and the more current state of the art. The components include items such as punch cards, transistors, vacuum tubes, microchips, printed circuit boards, "floppy" disks, and microprocessors.

2. A commercially available, tutorial program adapted for speech which can be used independently by the student beginning computer literacy instruction. Such programs typically focus on definitions of common terms and the location and function of various keys on the computer keyboard. "Apple Presents Apple" was selected and modified.
3. A program for developing keyboarding skills which has speech and large type output. Commercially available programs which could be adapted were reviewed. An excellent and inexpensive piece of software was found at Cross Educational Software. Talking Writer announces each key as it is struck (even open and closed apple, backslash, etc.). The Talking Writer game encourages speed in locating keys. Three auditory games and a simple word processing program are also included on the same diskette.
4. As part of the keyboard familiarization materials, a tactile keyboard is provided along with a reference card which contains information regarding the special keys and what characters are typed when holding down the shift key.

Work planned for FY 1986. These materials will be tested for legibility during the summer of 1985. Before field testing, a teacher's guidebook will be completed and will be included as part of the kit. Following evaluation, the materials will be revised as needed. Bob Glass has been responsible for the development of these familiarity materials. He was assisted by Debbie Willis. Larry Skutchan developed the program for the necessary modifications to "Apple Presents Apple."

### Manuals

Purpose: To provide large type and braille editions/adaptations of commonly used publications relative to the use of microcomputers

Work completed during FY 1985. Four publications were edited for large type editions and adapted for braille editions. These included: *The Random House Book of Computer Literacy*, *Apple IIe Owner's Manual*, *Echo II Speech Synthesizer*, and the *Apple DOS User's Manual*. Large type editions were published during the year. However, publication of braille editions was delayed due to changes being made in the braille computer code. These will be released early in FY 1986. Debbie Willis was responsible for the editing and adaptations made to these publications. She was assisted by Bob Glass.

The possibility of providing a publication on access technology was explored. One developed by Dr. Sandy Ruconich was identified as being a likely candidate for publication. However, this program was also selected for publication by the Hadley School for the Blind for use with one of their correspondence courses. This being the case, the needed information on access technology is available to anyone meeting Hadley's criteria free of charge and there is little need for the American Printing House for the Blind to publish information on access technology at this time.



### Spelling Program

Purpose: To modify the LIST BUILDER and SPELLING TEST programs on the Echo TEXTALKER diskette for greater versatility

Work completed during FY 1985. Mark Pfeffer of Street Electronics was contacted concerning the possibility of allowing the American Printing House to (a) use two programs on the ECHO II TEXTALKER diskette, TEXTALKER.RAM and TEXTALKER.RAM.OBJ and (b) to modify two other programs on the same diskette, LIST BUILDER and SPELLING TEST. The first two programs mentioned allow everything on the diskette to be spoken by voice synthesis. The purpose of LIST BUILDER is to build and save your own list(s) containing from one to 150 words per list. The purpose of SPELLING TEST is to call up a particular list of words to administer to a student or client.

The modifications of these programs, as recommended by the participants of the first Microcomputer Needs Meeting, were made and appropriate documentation written. The total program was evaluated by two blind members of the Needs Meeting committee. Their recommendations were categorized into "NOW" changes and "UPGRADE" changes. However, after the evaluation phase, it was determined that there were too many "bugs" still in the program to make it feasible to produce.

Work planned for FY 1986. A new spelling program which will address the same concepts, but be greatly improved will be developed. Debbie Willis was responsible for the initial work on this project. Larry Skutchan will develop the new program.

### Second Microcomputer Needs Meeting

Purpose: To identify and prioritize needs for educational materials to support use of microcomputers

Work completed during FY 1985. The second Microcomputer Needs Meeting was held at the American Printing House for the Blind on March 14 and 15, 1985. This second meeting was conducted somewhat differently from the first in that there were several presentations of software made at the second meeting. A limited selection of Sliwa Enterprises, Inc. (SEI) software was presented and demonstrated; a nonspeaking software program, "KIDS CAN! TYPER," then a segment of "KIDS CAN! TYPER" modified for Echo accessibility, was presented and demonstrated; the accompanying "AIMSTAR" was demonstrated; a voice accessible MECC social studies program was demonstrated; a public domain software program modified for Echo accessibility, "Math Decathlon," was demonstrated; a utility program to allow large print output to Apple compatible dot matrix printers was demonstrated; and the Super Graphics Package connected to an Apple IIe and a Cranmer Modified Perkins Braille was demonstrated. These items were discussed and various aspects of each were categorized on the needs list.

The greatest needs identified were:



1. GREATEST NEED: Make the American Printing House for the Blind a Central Clearinghouse for information on software and hardware. As part of the Clearinghouse activities, write a newsletter or column in *Journal of Visual Impairment & Blindness* to keep teachers informed of new products, how to use them, where to get them, etc.
2. The American Printing House should review math curricula, including model used by MECC, then develop math curriculum on diskettes for blind students.
3. Work with Ted Hasselbring and Carol Hamlett to modify "KIDS CAN! TYPER" program for voice and/or large type output.
4. Review Frank Irzyk's three diskettes of games. Fill one disk of best games that don't need documentation. Produce disks and make them available from the Printing House.
5. Modify approximately two pieces of MECC software in each of the following areas for grades 4-8: ENGLISH, SCIENCE, MATH, SOCIAL STUDIES, WRITING, and SIMPLE LOGIC.
6. The American Printing House should develop guidelines for software development, particularly with regard to voice component.
7. The Printing House should develop guidelines for teachers or other interested persons who develop or adapt software and give production rights to the American Printing House.
8. Finish David Hauck's two programs (Math Decathlon and Printer Choices) according to guidelines. Produce diskettes and make them available.
9. Use three manuals developed at the American Printing House for drill and practice on the APH Student Speech Plus Calculator and adapt content to diskettes for drill and practice using microcomputer.
10. Explore the possibility of modifying SEI software and/or of having Steve Sliwa create voice accessible software for the American Printing House.
11. Upgrade TEXTALKER to TEXTALKER.APH.

Another recommendation, as a continuing part of the American Printing House's activities, was to add software to the Central Catalog.

Debbie Willis and Bob Glass organized and conducted this second needs assessment.

### Microcomputer Applications

- Purposes:
- (a) To determine the current "state of the art" with regard to microcomputer hardware/software/manuals being used by legally blind persons
  - (b) To determine the needs of visually handicapped students/clients using microcomputers and related equipment/software/manuals
  - (c) To provide teachers and their visually handicapped students/clients with appropriate materials needed to enable students to access and use microcomputers and necessary peripherals
  - (d) To provide teachers with appropriate software and documentation for use in "teaching with computers"

Work planned for FY 1986. Some of the needs identified in the second Microcomputer Needs Meeting as well as other related activities will be addressed. These include arranging for a speech accessible version of the "KIDS CAN! TYPER" program, arranging for special editions of 33 pieces of the SEI software specifically designed for use by blind persons, developing guidelines for software development, conducting a second survey of hardware/software currently being used, developing a program to improve upon the TEXTALKER program, planning one or more additional needs meetings, and pursuing other activities as indicated previously in this report. Debbie Willis, Bob Glass, and Larry Skutchan will be responsible for these projects.

### Other Research

#### Academic Study on State Minimum Competency Testing Programs

Purpose: To determine if legally blind students in academic programs are performing at the same level as their sighted peers

Work completed during FY 1985. A telephone survey of the 50 states and the District of Columbia was conducted to determine the present status of minimum competency testing in the nation. Upon completion of this survey it was found that 12 states and the District of Columbia reportedly had a required minimum competency testing program that included the testing of visually handicapped students in both public and residential schools.

The information was used to develop a questionnaire for reporting total scores in reading and arithmetic for each grade level tested for the following groups: regular students, large type or print readers separated as to whether in public or residential schools; braille readers separated as to whether in public or residential schools. Since the tests differ from state to state, groups will be compared only within states. Trends in the data will be noted.

This data has been extremely difficult to collect. As of June 30, 1985, only five states had responded. Others have promised to respond by August so information on this may well be available by Annual Meeting.

Work planned for FY 1986. Plans are to continue collecting this information and to analyze it and write a report sharing this information with the field, if feasible. Bill Duckworth is responsible for this project.

#### Braillewriter Development

No work has been initiated on this project. New developments in the field have possibly negated the need for the American Printing House to initiate the development of a new, electronic braillewriter. A reanalysis of the need is indicated.

#### Analysis of Registration Data--1985

Purpose: To describe the legally blind population registered through the American Printing House for the Blind

Work planned for FY 1986. For a number of years, analyses were made of the registration data to relate characteristics of the legally blind population registered through the American Printing House for the Blind (e.g., degree of vision and mode of reading). No analyses of the registration data have been made since one conducted by Debbie Willis based on the 1979 data because of known ambiguities in some of the data categories. To address this problem and the one of identifying duplicates, the registration form has been redesigned and the directions for using it clarified. The resulting data should be more accurate and more comprehensive than ever before. Also, because date of birth is now required information, for the first time, the analyses will be able to include age information (e.g., average age of students at different grade levels). An analysis of the 1985 registration data is planned provided the Data Processing Department can provide the needed support. Categories for analyses will include age, agency (day school program, residential school program, multihandicapped facility, rehabilitation agency), grade placement, visual acuity (classified in the same nine categories used in previous analyses), and primary reading medium (visual, braille, auditory, prereader, nonreader). Suzette Frere will be responsible for conducting this study.

#### The World Book Year Book 1984 and 1985, Recorded Edition

Purpose: To provide a third yearbook combining information for 2 years to update information in *The World Book Encyclopedia*, Recorded Edition

Work completed during FY 1985. Plans were made with the publisher of *The World Book Encyclopedia* to publish a third combined yearbook. Arrangements were made to have graduate students and persons teaching in the English Department at the University of Louisville prepare copy for the



readers and for the braille and large type indexes, and work was initiated. The format will be the same as that for the edition combining the 1982 and 1983 yearbooks.

Work planned for FY 1986. Preparation of copy will be completed during the summer and release of the yearbook is planned for October or November 1985. June Morris is responsible for coordinating the various activities required by this project.

Agencies Participating in Research during FY 1985

Addie McBryde Rehabilitation Center for the Blind; Jackson, Mississippi  
Alabama Institute for the Deaf and Blind; Talladega, Alabama  
Arkansas Department of Education; Little Rock, Arkansas  
Arkansas Enterprises for the Blind, Inc.; Little Rock, Arkansas  
Arkansas School for the Blind; Little Rock, Arkansas  
Arlington Independent School District; Arlington, Texas  
Bradley Elementary School District; Columbia, South Carolina  
Burbank Elementary School; Houston, Texas  
California Orientation Center for the Blind; Albany, California  
Central Elementary School; Stephenville, Texas  
Children's Center for the Visually Impaired; Kansas City, Missouri  
Colorado Services for the Blind or Deaf; Denver, Colorado  
Conyer Elementary School; Visalia, California  
El Crystal Elementary School; San Bruno, California  
Ellisville State School; Ellisville, Mississippi  
Fairmont Elementary School; El Cerrito, California  
Florida Department of Education; Tallahassee, Florida  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
Florida State Exceptional Student Unit; Ft. Lauderdale, Florida  
Forest Hills Elementary School; Eden Prairie, Minnesota  
Forest Lake Elementary School; Columbia, South Carolina  
Frances Blend Elementary School; Los Angeles, California  
Georgia State Department of Education; Atlanta, Georgia  
Gregory-Lincoln School; Houston, Texas  
Hawaii State Department of Education; Honolulu, Hawaii  
Illinois Department of Rehabilitative Services; Champaign, Illinois  
Indiana School for the Blind; Indianapolis, Indiana  
Iowa Braille and Sight Saving School; Vinton, Iowa  
Iowa Department of Public Instruction; Des Moines, Iowa  
Jefferson County Public Schools; Louisville, Kentucky  
Johnson Elementary School Visually Handicapped Program; Denver, Colorado  
Kansas Services for the Blind; Topeka, Kansas  
Kansas State Department of Education; Topeka, Kansas  
Kentucky Department for the Blind; Louisville, Kentucky  
Kentucky School for the Blind; Louisville, Kentucky  
Kirksville R III School; Kirksville, Missouri  
Leawood Elementary; Columbus, Ohio  
Lester Elementary School; Florence, South Carolina  
Lincoln Public Schools; Lincoln, Nebraska  
Lincoln School; Fall River, Massachusetts  
Little Cypress Junior High School; Orange, Texas  
Louisiana State Department of Education; Baton Rouge, Louisiana  
Maryland Public Schools (Prince George's County); Baltimore, Maryland  
Maryland School for the Blind; Baltimore, Maryland  
Metcalf Special Education, I.S.U. Laboratory Schools; Normal, Illinois  
M.I.C.E. Program, Department of Public Health; Concord, New Hampshire  
Mississippi Industries for the Blind; Jackson, Mississippi  
Mississippi School for the Blind; Jackson, Mississippi  
Missouri School for the Blind; St. Louis, Missouri

Morgan County School; Stover, Missouri  
Natividad Elementary School; Salinas, California  
New Jersey Commission for the Blind and Visually Impaired; Newark, New Jersey  
New Mexico School for the Visually Handicapped; Alamogordo, New Mexico  
New Mexico State Department of Education; Alamogordo, New Mexico  
New York Institute for the Education of the Blind; Bronx, New York  
New York State Education Department; Albany, New York  
North Carolina Department of Public Instruction; Raleigh, North Carolina  
Oak Hill School; Hartford, Connecticut  
Oakland Center; Lawrenceville, Georgia  
Office of Special Education; St. Louis, Missouri  
Oregon State School for the Blind; Salem, Oregon  
Patrick Henry Middle School; Houston, Texas  
Perkins School for the Blind; Watertown, Massachusetts  
Pharr San Juan Alamo ISE Ford Elementary; Pharr, Texas  
Pinewood School; Omaha, Nebraska  
Plainfield Elementary School; Plainfield, New Hampshire  
Powers Ferry Elementary School; Marietta, Georgia  
Prospect School; Clarendon Hills, Illinois  
Region 6 Education Service Center; Huntsville, Texas  
Richmond School; St. Charles, Illinois  
Royal Maid; Hazelhurst, Mississippi  
San Jose Unified School District; San Jose, California  
Sheryland ISE Shery Elementary; Mission, Texas  
South Carolina Commission for the Blind; Greenville, South Carolina  
St. Lucy Day School; Philadelphia, Pennsylvania  
Stott Elementary School; Lakewood, Colorado  
Tennessee Department of Education; Nashville, Tennessee  
Tennessee School for the Blind; Donnelson, Tennessee  
Texas Commission for the Blind; Austin, Texas  
Texas Education Agency; Austin, Texas  
Texas School for the Blind; Austin, Texas  
Vinson-Owen School; Winchester, Massachusetts  
West Tatnuck School; Worcester, Massachusetts  
West University School; Houston, Texas  
Williamstown Public Schools; Williamstown, Massachusetts  
Windy Hills Elementary; Kearney, Nebraska  
Wisconsin School for the Visually Handicapped; Janesville, Wisconsin  
Wolters Elementary School; Fresno, California  
Wunderlich Intermediate School; Houston, Texas



Consultants during FY 1985

Braille Language Program

Dr. Samuel C. Ashcroft, Professor Emeritus of Special Education, George Peabody College for Teachers, Vanderbilt University, Nashville, Tennessee

Mrs. Helen Berry, Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Mrs. Debbie Mullarkey, Teacher of the Primary Visually Handicapped, Leawood School, Columbus, Ohio

Mrs. Mary Powers, Consultant for the Visually Handicapped (Retired), South Carolina State Department of Education, Columbia, South Carolina

Ms. Sara Spivey, Teacher (Retired), Cobb County Schools, Marietta, Georgia

Braille Unit Recognition Test

Mrs. Sarah Ashman, Psychologist, Indiana School for the Blind, Indianapolis, Indiana

Dr. Eric Hamp, Professor, Department of Linguistics, University of Chicago, Chicago, Illinois

Mrs. Freda Henderson, Curriculum Director (Retired), Tennessee School for the Blind, Nashville, Tennessee

Dr. Warren Lacefield, Professor, Department of Statistics, University of Kentucky, Lexington, Kentucky

Dr. Earl Rankin, Professor, Department of Curriculum and Instruction, University of Kentucky, Lexington, Kentucky

Educational Measures

Mrs. Sarah Ashman, Psychologist, Indiana School for the Blind, Indianapolis, Indiana

Dr. F. G. Ferguson, President, Curriculum Associates, North Bellerica, Massachusetts

Light Box Materials Level III

Ms. Beth Langley, Coordinator, Diagnostic Prescriptive Project for Profoundly Handicapped, Pinellas Park, Florida

Ms. Norreen Murphy, Teacher, Euclid Center, St. Petersburg, Florida

Teacher Evaluators

- Ms. Mary Jane Frankoviak, Teacher, Indiana School for the Blind, Indianapolis, Indiana
- Ms. Gail Hartigan, Teacher, Prospect School, Clarendon Hills, Illinois
- Ms. Janet Huff, Teacher, Prospect School, Clarendon Hills, Illinois
- Ms. Linda Kay Kirsch, Teacher, Indiana School for the Blind, Indianapolis, Indiana
- Ms. Elizabeth Nolan O'Donnell, Teacher, St. Lucy Day School, Philadelphia, Pennsylvania
- Ms. Ellen Perry, Teacher, Leawood Elementary, Columbus, Ohio
- Ms. Michelle Peterson, Teacher, Prospect School, Clarendon Hills, Illinois
- Ms. Ela Shacklett, Teacher, Children's Center for the Visually Impaired, Kansas City, Missouri
- Ms. Martha Wyrsh, Teacher, Children's Center for the Visually Impaired, Kansas City, Missouri

Materials for Adolescent Multihandicapped Visually Impaired Students

- Dr. Hank Baud, Administrator, Alabama Institute for the Deaf and the Blind, Talladega, Alabama
- Ms. Mary Jane Blythe, Rehabilitation Instructor, Addie McBryde Rehabilitation Center for the Blind, Jackson, Mississippi
- Mr. Monroe Frazier, Supervisor, Mississippi Industries for the Blind, Jackson, Mississippi
- Mr. Lynwood French, Prevocational Teacher, Helen Keller School for the Deaf-Blind, Alabama Institute for the Deaf and the Blind, Talladega, Alabama
- Ms. Georgia Grandbury, Supervisor, Ellisville State School, Ellisville, Mississippi
- Mr. Roy Granger, Supervisor, Royal Maid Workshop, Ellisville State School, Ellisville, Mississippi
- Dr. Lars Guldager, Superintendent, Oak Hill School, Hartford, Connecticut
- Ms. Jan Hawthorn, Rehabilitation Instructor, Addie McBryde Rehabilitation Center for the Blind, Jackson, Mississippi
- Ms. Joan Lacey, Supervisor, West Suburban Association, Lombard, Illinois

Mr. Kevin Lessard, Acting Director, Perkins School for the Blind, Watertown, Massachusetts

Mr. Billy Sparkman, Supervisor, Royal Maid Industries, Hazelhurst, Mississippi

Mr. Louis Strickland, Director, Addie McBryde Rehabilitation Center, Jackson Mississippi

Mrs. Diann Willis, Supervisor, Alabama Institute for the Deaf and the Blind, Talladega, Alabama

Mr. Dan Worth, Supervisor, Alabama Institute for the Deaf and the Blind, Talladega, Alabama

#### Microcomputer Applications

Ms. Lynn Albright, Director, New Hampshire Educational Services for the Visually Handicapped, Concord, New Hampshire

Dr. Samuel C. Ashcroft, Professor Emeritus of Special Education, George Peabody College for Teachers, Vanderbilt University, Nashville, Tennessee

Mr. Bob Brasher, State Coordinator of Educational Services for the Visually Impaired, Arkansas Department of Education, Little Rock, Arkansas

Mrs. Phyllis Brunken, Media Specialist, Nebraska Department of Education, Columbus, Nebraska

Mr. Keith Creasy, Technology Specialist, Kentucky Department for the Blind, Louisville, Kentucky

Dr. Mark Cross, President, Cross Educational Software, Ruston, Louisiana

Dr. Emerson Foulke, Professor, Perceptual Alternatives Laboratory of the University of Louisville, Louisville, Kentucky

Mrs. Carla Franklin, Technology Specialist, Kentucky Council for the Blind, Louisville, Kentucky

Ms. Carol Hamlett, Doctoral Student, Peabody College of Vanderbilt University, Nashville, Tennessee

Dr. Ted Hasselbring, Associate Professor, Peabody College of Vanderbilt University, Nashville, Tennessee

Mr. David Hauck, Rehabilitation and Technology Specialist, Illinois School for the Visually Impaired, Jacksonville, Illinois

Mr. Frank Irzyk, Media Specialist, New York Institute for the Education of the Blind, Bronx, New York

Ms. Kit Kengott, O & M Specialist, Exceptional Student Services, Ft. Lauderdale, Florida



Mrs. Sherry Lowry, President, Speech Enterprises, Inc., Houston, Texas

Ms. Cathy Mack, Learning Technology Specialist, Peabody College of Vanderbilt University, Nashville, Tennessee

Dr. Sandy Ruconich, Learning Technology Specialist, The Hadley School for the Blind, Winnetka, Illinois

Dr. LaRhea Sanford, Vision Specialist, Nashville Public School System, Nashville, Tennessee

Mr. Bill Schenk, Technology Specialist, Tennessee School for the Blind, Donnelson, Tennessee

Dr. Steve Sliwa, President, Sliwa Enterprises, Inc., Yorktown, Virginia

Ms. Susan Williams, Programming Specialist, Peabody College of Vanderbilt University, Nashville, Tennessee

Mrs. Bonita Wilson, Typing Instructor, Kentucky School for the Blind, Louisville, Kentucky

#### Prevocational

Mrs. Gretchen Stone, Occupational Therapist, Texas School for the Blind, Austin, Texas

#### Read Again

Ms. Joan N. Binder, Braille Teacher, The Hadley School for the Blind, Winnetka, Illinois

Ms. Pam Cannon, Teacher, Atlanta Area Services for the Blind, Atlanta, Georgia

Ms. Margie Cernitz, Teacher, Montgomery County Schools, Bethesda, Maryland

Ms. Marietta Howington, Teacher (Retired), Tennessee School for the Blind, Nashville, Tennessee

Ms. Marjorie Miller, Assistant Director, Professional Services, Chicago Lighthouse for the Blind, Chicago, Illinois

Dr. Roseann Reid, Chairman, Education Department, Greater Pittsburgh Guild for the Blind, Bridgeville, Pennsylvania

Research and Developmental Personnel for FY 1985

|                       |                                 |
|-----------------------|---------------------------------|
| Bensinger, Sharon, BS | Research Assistant (July-March) |
| Bolin, Gene           | Library Clerk/Clerk Typist      |
| Caton, Hilda, EdD     | Research Scientist (part time)  |
| Davis, Gary           | Mechanical Designer*            |
| Duckworth, Bill, MS   | Librarian/Research Scientist    |
| Franks, Frank, EdD    | Research Scientist (July-Sept.) |
| Frere, Suzette, BA    | Research Associate              |
| Glass, Robert, MEd    | Research Associate              |
| Moore, Sheri, MS      | Research Scientist              |
| Morris, June, MA      | Director                        |
| Pester, Eleanor, MS   | Research Associate              |
| Poppe, Tom            | Model and Pattern Maker*        |
| Walsh, Jeannette      | Secretary                       |
| Willis, Deborah, BA   | Research Associate              |

\*Design and Development Section

Publications during FY 1985

Barth, J. L. (1984). Beyond words. Aids & Appliances Review, Issue No. 14, 22-28.

Franks, F., & Glass, R. (1984). Fundamental mathematics concepts for physically handicapped students: The FOCUS in Mathematics program: Final report. Louisville, KY: American Printing House for the Blind. (NSF Grant No. SED-8109074)

Frere, S. (1984, December). Comprehensive programs for the visually handicapped: Low vision training materials from the American Printing House for the Blind. DVH Quarterly, 29(2), 31-35.

Moore, S. (1984). The need for programs and services for visually handicapped infants. Education of the Visually Handicapped, 16, 48-57.

Pester, E. J. (1985, March). Comprehensive programs for the visually handicapped. Braille readiness and reading materials from the American Printing House for the Blind. DVH Quarterly, 29(3), 26-31.

PROGRAM MATERIALS

Barth, J. L., & Berla, E. P. (1984). Tangible graphs: Teacher's guide. Louisville, KY: American Printing House for the Blind.

Caton, H., & Duckworth, B. (1985). Braille Unit Recognition Battery: Diagnostic test of grade 2 literary braille. Louisville, KY: American Printing House for the Blind.

Caton, H., Duckworth, B., & Rankin, E. (1985). Braille Unit Recognition Battery: Diagnostic test of grade 2 literary braille--manual. Louisville, KY: American Printing House for the Blind.

Moore, S., Bensinger, S., & Frere, S. (1985). Beginnings: A practical guide for parents and teachers of visually impaired babies. Louisville, KY: American Printing House for the Blind.

Moore, S. B., Bensinger, S. G., Frere, S. J., & Dennison, A. L. (1984). Bright Sights: Learning to See. Louisville, KY: American Printing House for the Blind.

Pester, E. J., & Bradley, E. J. (1984). Patterns library series second reader level notes for teachers. Louisville, KY: American Printing House for the Blind.

Pester, E. J., & Bradley, E. J. (1985). Patterns library series third reader level notes for teachers. Louisville, KY: American Printing House for the Blind.



Presentations and Workshops during FY 1985

- Bensinger, S. G. (1984, October). Workshop on American Printing House materials for preschool and multihandicapped. Chattanooga Center for Exceptional Children, Chattanooga, TN.
- Bensinger, S. G. (1985, May). Workshop on low vision and vision stimulation materials. Child Development Centers of the Blue Grass, Lexington, KY.
- Caton, H. R. (1984, July). Patterns: The Primary Braille Reading Series. Conference for teachers of the visually handicapped, Great Britian University of Birmingham, England.
- Caton, H. R. (1984, October). Patterns: The Primary Braille Reading Series. In-service meeting for teachers of the visually impaired, Louisville, KY.
- Glass, R. D. (1984, September). FOCUS workshop: Academic edition. Colorado School for the Blind, Colorado Springs, CO.
- Glass, R. D. (1984, October). FOCUS workshop: Academic and multihandicapped editions. Annual meeting of the American Printing House for the Blind, Louisville, KY.
- Glass, R. D. (1984, November). FOCUS workshop: Academic and multihandicapped editions. South Carolina Department of Education, Columbia, SC.
- Glass, R. D. (1985, April). Current American Printing House educational software development projects. Illinois School for the Visually Impaired, Jacksonville, IL.
- Moore, S. B. (1985, June). Preschool/multihandicapped visually impaired children. Mid-Eastern regional meeting of the Association for Education and Rehabilitation of the Blind and Visually Impaired, Philadelphia, PA.
- Morris, J. E. (1984, October). The American Printing House for the Blind: Its research program and new products. West Virginia Schools for the Deaf and the Blind, Romney, WV.
- Morris, J. E. (1985, June). Seminar: Issues related to developing or adapting tests for use by visually handicapped persons and the administration of such tests. Educational Testing Service, Princeton, NJ.
- Pester, E. J. (1984, August). Braille reading programs for adults. Mid-American Conference for Rehabilitation Teachers, Tulsa, OK.
- Pester, E. J. (1984, November). Primary braille reading and readiness. South Carolina Department of Education, Columbia, SC.
- Willis, D. H. (1984, November). Microcomputer materials available for legally blind students. South Carolina Department of Education, Columbia, SC.











DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES

FISCAL 1986

**American  
Printing House  
for the Blind  
Incorporated**

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An ambitious research and development program was maintained during FY 1986 which was responsive to the needs of the field and consistent with the priorities recommended by the American Printing House for the Blind's (APH) Educational Research and Development Committee. This Committee recommended top priority be given to the development of materials enabling blind students to use microcomputers. It also recommended that the development of special materials for multihandicapped and early childhood visually handicapped persons be given high priorities. In addition to these three areas, other areas where product needs were addressed included: prevocational skills, low vision stimulation and training, braille readiness and training, and educational measures. Looking to the future, a study was initiated during the year from which planning information for APH and its research program will be culled.

Research and Development activities of the Department of Educational Research were funded through the federal appropriation; APH; and a grant from the Special Education Programs, Office of Special Education and Rehabilitative Services, U.S. Department of Education which partially supports the development of a Braille Language Program to parallel APH's Patterns braille reading program. Appropriated funds were cut by 4.3% on March 1, 1986, as a result of implementation of Gramm-Rudman-Hollings. Uncertainties as to financial support for the program have necessitated planning a "lean" research program for FY 1987. A \$5,000. grant was received from the Dreyfus Foundation which enabled APH to have Budd and Delores Hagan, of Closing the Gap fame, give an in-service for professional staff and invited guests and to acquire additional equipment for its microcomputer laboratory.

Research staff members have remained actively involved in dissemination activities during the period reflected in this report. Staff members regularly make presentations, give workshops, serve on committees, write articles for newsletters and journals, respond to correspondence and phone queries, and attend conferences. They have been responsible for a new service APH is offering; namely, the offering of summer seminars. During July 1985 a seminar was offered entitled "Methods and Materials for Rehabilitation of Visually Handicapped." Roseann Reid served as instructor. Two other

topical seminars in special education were held in June 1986. One was "Methods and Materials for Low Vision Diagnosis, Stimulation, and Training." The other was "Methods and Materials for Teaching Braille Reading." They were taught by Ruth Holmes and Hilda Caton, respectively. The summer seminar program was a joint effort between APH and the University of Louisville. Additionally, a special workshop is planned and will be offered on the day preceding APH's 1986 Annual Meeting for persons teaching vision courses in university personnel preparation programs. The offering of this workshop is in response to a request for such expressed by this group and will serve to update university personnel about APH's products and services.

As always, support for the research program has been splendid both within APH and without. The program could not exist without the cooperation extended to it by others. Within house, special mention should be made of Ralph McCracken, Mary Nelle (Council) McLennan, and Scott Blome of the Editorial Department; and of Bob Phelps, Cullen Slone, and James Robinson, of the Project Department. These individuals work on a daily basis with research staff as new products move from the Department of Educational Research through APH's production pipeline. Of special interest, during FY 1986 a new process was implemented for the production of microcomputer programs--a new product line. New products resulting from the research and development program included:

New Products Released during FY 1986

Braille editions of microcomputer related manuals:

The Random House Book of Computer Literacy

Apple //e Owner's Manual

Echo II Speech Synthesizer

Apple // DOS User's Manual

The World Book Year Book 1984-1985, Recorded Edition

Light Box Materials: Level II

Basic Reading Rate Scale, Braille and Large Type Editions

New Products To Be Released Early in FY 1986

Talking Apple Literacy Kit (TALK): Apple //e Edition

Light Box Materials: Level III

Cassette editions of microcomputer related manuals:

Running MS-DOS

Pro-DOS User's Manual (Apple)

Microcomputer programs:

Speaking Speller

TEXTALKER

MECC's Elementary Volume 1--Mathematics

Echo Commander: Complete  
Echo Commander: Control

Game Kit

Research and development projects underway during FY 1986 and planned for FY 1987 are briefly described in the sections of this report that follow.



## Early Childhood and Multihandicapped

### Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children

Purpose: To develop a set of materials, targeted for professionals and parents, to assist in developing critical skills in visually handicapped children, birth-24 months

Two of the three components of this project have completed production and are available for distribution. These include a guidebook, Beginnings: A Practical Guide for Parents and Teachers of Visually Impaired Babies and a slide-cassette program, "Playing the Crucial Role in Your Child's Development." The slide-cassette program is also available in Spanish. Both products are designed for the professional or parent working with visually handicapped children, birth-24 months.

Work completed during FY 1986. The third component, a sound-producing sensory mat, is constructed to enhance the young blind or visually handicapped child's auditory and motor development. When activated by the child's movement, the mat produces motivating and pleasing tones, encouraging the development or refinement of a variety of gross motor skills. The sensory mat continues to be refined and improved, based on state of the art electronics. It has been redesigned to include a large membrane switch, which is made by silk-screening silver or copper traces onto plastic sheets. The electronics which control the mat have also been redesigned to incorporate a microprocessor based circuit board with an accompanying software program. These modifications will enable the mat to produce songs as well as tones, reduce unit cost, and provide a more dependable product.

Work planned for FY 1987. Sheri Moore will continue to work closely and cooperatively with related Printing House staff as the sensory mat is refined and readied for production.

### Sensory Development Materials for Adolescent Multihandicapped Visually Impaired Students

Purpose: To develop and evaluate a set of materials useful in meeting identified needs of adolescent multihandicapped students who have achieved basic skill levels

Work completed during FY 1986. A project has been initiated to develop materials for the older multihandicapped visually impaired student who needs assistance in developing and reinforcing basic sensory processes using age-appropriate materials. Consumers have requested such a collection of materials. These educational materials are targeted for multihandicapped visually impaired students who have achieved basic skill levels and are chronologically 10-18 years old. These students would be approximately at a functionally, minimum 5 year level.

Included in this set of materials is a combination of adapted commercial materials and Printing House designed items. Plans also call for inclusion of several switch activated devices. In designing the Sensory Development Materials, consideration has been given to both educational and leisure skill applications.

An extensive literature search has been completed, affording a sound basis for product development. Literature in the areas of blindness and visually handicapped, developmentally disabled, deaf-blind, multihandicapped, mentally retarded, and severe/profound handicapping conditions was surveyed in the fields of both education and rehabilitation. Specifically, journal articles, media, curriculums, and books pertaining to sensory training, age-appropriate materials, the multihandicapped adolescent, daily living skills, community living skills, self-help skills, life skills, survival skills, group home living skills, and transition were reviewed. Also, a commercial materials search was initiated and completed to identify existing commercial items and curricula related to the topics. In addition, a literature and materials search specifically for switch activated devices was undertaken.

Subsequent work revolved around identifying specifications for development of tangible prototypes. Several prototypes have been developed; other tangible items have been purchased for modification. The Design and Development Section of the research department has been responsible for the development of the prototypes.

Work planned for FY 1987. Work will continue on developing a complete set of prototypes, including adapted commercial items and APH developed materials. Simultaneously, accompanying written materials, including teacher guidelines and suggested activities, will be drafted. Activities will include environmental applications stressing the importance of developing independence, self-sufficiency, and community living/life skills.

Following completion of these tasks, sets of prototypes materials will be gathered for field testing. Field evaluation sites will be identified and appropriate arrangements will be made. Forms for the gathering of teacher and student evaluative data will be generated. Field evaluation is scheduled for a minimum of eight sites, recognizing program type and geographic distribution of subjects. Later, project staff will post and analyze the field evaluation data and determine needed revisions and modifications.

Sheri Moore has been responsible for this project, assisted by Gary Davis and Suzette Wright.

#### Fine Motor Development Materials

Purpose: To design a set of tangible materials useful in developing critical fine motor functions for visually handicapped and blind children, birth-48 months



Work completed during FY 1986. The Fine Motor Development Materials are designed to assist young and multihandicapped visually impaired students (birth-36 month functional level) in developing, refining, and reinforcing small motor functions. These tangible items, consisting of eight modular units, assist in developing fine motor skills such as reaching and grasping, raking or whole hand use, pincer grasp, wrist rotation, searching technique, palmar grasp, visual-motor, and visual-perceptual coordination.

Production models of the materials were developed and a study was made of production methods. This study analyzed and described three possible manufacturing systems: simple hand fixtures, hydraulic and pneumatic assisted fixtures, and computer driven fixtures. A method of manufacturing has been selected, based on efficiency of production and unit cost.

The Fine Motor Development Materials have been evaluated for safety by an independent laboratory. All units were tested against the stringent infant toy safety standards set by the Consumer Product Safety Commission. Areas of testing include impact/drop, small parts, ingestion hazard, sharp edge, torque, flexure, tension, and other tests. All eight units of the Fine Motor Development Materials passed the evaluation.

Work planned for FY 1987. Project staff will remain involved with and supportive of production personnel as manufacturing of the Fine Motor Development Materials proceeds.

Sheri Moore has been and is responsible for this project. Gary Davis developed the production models and conducted the study of production processes.

#### Early Childhood Educational Materials Needs Assessment Meeting

Purpose: To determine needed educational materials, as identified by consumers, to assist in the development of skills for blind and visually handicapped infants and preschool children

Work completed during FY 1986. A meeting of teachers and related professionals, working with blind and visually handicapped infants and preschoolers, was conducted to determine needed educational materials for this population. The initial meeting took place in Alamogordo, New Mexico, in October 1985 at the New Mexico School for the Visually Handicapped. The needs assessment process was a component of the 11th International Symposium on Infant and Preschool Blind and Visually Impaired Children. The majority of professionals participating in the symposium voiced needs for an array of educational materials to provide solid skill development in the early years, particularly in areas of development where the visually handicapped and blind child fall behind. Much discussion was also generated concerning the large numbers of young multihandicapped visually impaired children that infant/preschool programs increasingly serve.

Although this meeting yielded several interesting materials needs, time allotted to the Printing House was not adequate for the task of identifying specific educational materials. Thus, a second and more intensive needs assessment meeting was conducted during the Council for Exceptional Children conference in New Orleans in April 1986. At this meeting, the general suggestions generated in the October 1985 meeting were presented and several were developed into recommendations for specific educational materials development projects. In addition, needs assessment participants introduced and discussed a variety of new materials development projects.

Initially discussion centered around the children within the early childhood range most in need of educational materials. After a lively discussion, the group determined that infants were most needy, including the multiply handicapped blind/low vision infant. It was felt that there were numerous unmet materials needs for preschoolers and older multihandicapped children as well. However, the group's priority for most needed materials was with the infants (birth-36 months). The primary reason for this decision was the group's assessment of the critical nature of early intervention and the need for specifically developed educational materials to assist in preventing significant developmental delay.

Following is a summary of the group's deliberations, indicating items given highest priority by the needs assessment group.

1. Infant skills kit--a collection of tangible child-use materials effective in teaching the development of critical skills, especially those in which blind/low vision children traditionally show substantial delay. Examples of such skills include: head righting, grasping/releasing, bringing hands together, crossing midline, weight bearing on feet, and so on.
2. Switch-activated materials--an assortment of tangible child-use switches designed to be activated by pressure. The purpose of the switch-activated materials is to teach causal relationships and to learn control over the environment. Specifically, a mercury switch for head righting was suggested along with pressure switches to activate battery operated devices, a number of which are already contained in the Sensory Stimulation Kit.
3. Beginning picture books with visual and tactual interest--a series of books designed to use with a low vision child or a tactual learner. Books should deal with the young child's environment and related experiences. Each book should incorporate high visual interest graphics as well as interesting tactile displays.
4. National Library Service (NLS) recorded tapes for young children--there is a need for age-appropriate tapes available from NLS for early childhood level learners. Presently, the tapes are too complex and involve advanced concepts and language.



5. "Peel and Feel"--adhesive backed sheets of varied colors and textures (examples: felt, plastic, sandpaper) used for labeling, tactile discrimination exercises, personal identification, and environmental coding.

Work planned for FY 1987. During the later part of FY 1987, all of the materials development projects prioritized through the needs assessment process will be studied and reviewed. This exercise, including feasibility studies, will be used to determine the focus of APH's early childhood materials development efforts for the next several years.

Sheri Moore is responsible for this project.

## Prevocational

### Prevocational Skills Development Materials II

**Purpose:** To develop a prevocational skills kit that will utilize assessment and programming strategies which will include activities to develop work habits and skills needed in the vocational setting

Work completed during FY 1986. Written materials form the most important component of the Austin Work Skills Program. More than an assessment tool, the program's inventory of skills leads directly to specific activities with suggested environmental materials and APH-produced tangibles appropriate for use with each training task. Over the past year, revision of the program as recommended by research staff by its author, Gretchen Stone, has resulted in a curriculum which emphasizes the training of work processes, rather than isolated manipulative skills.

Both the inventory and activities are divided into two levels. The first, for deaf-blind and multihandicapped students functioning at the sensory-motor stage, provides experiences with a wide variety of objects. Tasks are presented in clusters which emphasize the fact that the same actions can be appropriately used with many objects--taking apart objects by various means (disassembly), aligning and connecting (assembly), placing in containers (packaging), etc. The program is not intended to offer complete programming for students at this stage. It addresses, as its name implies, processes which may, later, become a basis for training toward sheltered workshop employment. Level two of this program is targeted at the preoperational stage of development. Work processes are again emphasized; the student is presented with sorting, assembly, and packaging tasks performed individually and in a group setting.

Prototypes of the tangibles were developed during the year. These were tried by the author with her students at the Texas School for the Blind and found useful.

Work planned for FY 1987. The materials will be placed in prevocational programs for evaluation. Subjects will have at least one handicapping condition in addition to legal blindness and will be age 10 or higher. Data collected on the tangibles will include information on the manipulability, durability, safety, appropriateness, and interest level of the students relative to similar materials; while the program as a whole will be evaluated in terms of its effectiveness in teaching identified skills.

Bill Duckworth, assisted by Suzette Wright and Tom Poppe, is responsible for this project.

### Low Vision

#### Bright Sights: Learning to See (Vision Stimulation and Training Materials for Developmentally Young Visually Impaired Students, Birth-36 Months)

Purpose: To develop a kit of materials, divided into two levels of difficulty (sensory and perceptual), useful in assisting visually handicapped students functioning at a birth-36 month level to learn to use remaining vision

Work completed during FY 1986. Since Bright Sights has become available to consumers, a number of presentations and workshops detailing suggested uses have been given. These presentations generally cover such topics as guidelines for use, safety considerations, suggested activities, creative applications, information regarding the development and field evaluation of the materials, and a visual developmental sequence of Printing House low vision products.

Work planned for FY 1987. A detailed final report will be completed, providing a sequential framework for all project activities.

Sheri Moore is responsible for all activities related to this project.

#### Light Box Materials Level III

Purpose: To develop a set of materials and related activities to use with the Light Box to facilitate the development of residual vision in children functioning from 4-6 years of age

As planned, the Level III written and tangible materials were revised following analysis of field evaluation data collected in April and May of 1985. Additional graphics requested by evaluators were created and the kit's thermoformed trays were redesigned slightly and have been produced in a different plastic, significantly improving their durability. Written activities were reorganized based upon an analysis of student's pretest performances, placing more difficult skill areas toward the end of the guidebook's activity section. Approximately 30 illustrations were drawn and

research staff edited and marked the 145-page guidebook for typesetting. One hundred worksheet masters were redrawn or touched up to provide camera-ready copy.

Careful consideration was given to packaging of the Level III kit. Working with an APH Manufacturing Specialist, customized, clear vinyl display/storage pages were designed for the kit's 600 graphics. The labeled pages are organized in a matching ring binder. A zippered case was produced to hold all kit materials.

Work planned for FY 1986. Work on the Light Box Materials: Level III largely has been completed. A final report detailing the development and evaluation of the materials will be written.

Suzette Wright has directed this project. Sheri Moore was responsible for the final evaluation of the materials.

#### Developing Vision through Lights (product name--Lights On: Learning to See)

Purpose: To identify a set of light related materials that prove useful in developing remaining vision in visually handicapped students functioning on a birth-36 month level

Work completed during FY 1986. Work has continued on these light-producing materials to ready them for production. The materials were submitted to an independent laboratory for safety evaluation. Since these items are designed for use by teachers, it was determined that they do not need to go through the standard evaluation process.

As the Developing Vision through Lights materials have been turned over to production, project staff have worked closely with production's project department. This department's primary function is to analyze the materials for ease of production and cost-effective production.

Work planned for FY 1987. A final expert review of all project activities, guidelines, and suggestions for use will be conducted. Also, a final report summarizing all activities related to the development of these materials will be completed.

Sheri Moore has been responsible for this project.

#### Identification of Research Needs in Low Vision

Purpose: To review and evaluate the existing research on low vision and to identify current research needs in low vision

Work completed during FY 1986. An annotated bibliography of nonmedical research on low vision was completed and submitted to five experts in the area of low vision for review and use as a basis for writing "think pieces" on research needs in low vision. Three of the "think pieces" were



completed, and efforts were made to obtain additional ones. A cursory review of the three completed "think pieces" indicated great diversity in the perceived needs for low vision research.

Work planned for FY 1987. As soon as the final "think pieces" are completed, all will be analyzed to determine areas of commonality pointing to needed research.

Eleanor Pester is responsible for this project.

## Braille

### Patterns Library Series

Purpose: To develop sets of braille books which succeed the levels of Patterns: The Primary Braille Reading Program from Preprimer through Third Reader and which provide a means of practicing reading and discovering that reading can be fun

Work completed during FY 1986. The final report on the development of the Patterns Library Series was written and filed, completing work on this project.

Eleanor Pester was responsible for this project. Eddy Jo Bradley served as the directing editor.

### Read Again: A Program for Adventitiously (Recently) Blinded Persons

Purpose: To develop a set of materials designed to teach braille to persons who have lost their vision after initially learning to read print

Work completed during FY 1986. Once again plans for this project proved to be too ambitious for the amount of time available; however, the program made progress. Revisions, including new reading applications of the units introducing braille letters, numbers, and basic punctuation were completed, prepared in both braille and print on the computer, and sent to the consulting committee members for review. The committee met and seemed generally pleased with the way their previous recommendations had been incorporated into the revised units. The committee's major suggestions this time involved incorporating the practice worksheets and reading applications throughout the units whenever possible rather than putting them at the ends of the units.

Following this meeting, these units were once again revised to reflect these organizational changes. The tactual discrimination unit was also revised to conform to the language of the previously revised units, completing work on Part I of the Read Again program which deals with Grade 1 braille.



An article on the survey of adventitiously blind people learning braille, done in connection with this project, was written and submitted for publication.

Work planned for FY 1987. Part II of the Read Again program, which deals with Grade 2 braille, will be revised and sent to the committee members for final review. An article will be written based on another study made in connection with this project. The study compares the sequence used to introduce the braille code in a number of programs for new braille users.

Hilda Caton and Eleanor Pester are responsible for this project. Eddy Jo Bradley is the directing editor.

#### Braille Readiness Program

Purpose: To develop a comprehensive, sequentially organized braille readiness program

Work completed during FY 1986. The complete readiness program of 80 lessons was placed at field test sites in California, Kentucky, and Ohio for in-use evaluation during the 1985-86 school year. Each teacher evaluator at these sites completed an overall evaluation of the program and evaluations of each of the individual lessons.

Work planned for FY 1985. Data collected during the field testing will be used to make the final revisions in the braille readiness program which will then be ready for production.

Hilda Caton and Eleanor Pester are responsible for this project. Eddy Jo Bradley wrote the lessons.

#### Braille Language Program

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Work completed during FY 1986. Of the 75 special braille editions of the language, spelling, and word study skills of the Stanford Achievement Test, Intermediate 1, Form E, sent out, 57 were completed and returned. Tests were checked and raw scores, percentiles, and grade equivalents were recorded and individual test items were analyzed to use as background information for the development of the Braille Language Program.

The first level of the program was completed, reviewed, revised and then prepared and sent to test sites in Virginia and Kentucky for a pilot study which began in December. Later members of the consulting committee were sent review copies after which they met to consider this level of the program. Results indicated the committee was well pleased.

Detailed specifications for the second level of the program were developed and work was begun on the second level of the Braille Language Program.

At the end of the school year, final pilot study evaluations were received and reviewed for the first level. These materials were revised accordingly. Their field evaluation will be conducted during the 1986-87 school year.

Work planned for FY 1987. The item analyses for the special braille edition of the language, spelling, and word study skills of the Stanford Achievement tests will be completed. The first level of the program will be placed at the field test sites and the second level of the program will be placed at the pilot study sites. The consulting committees will meet again to review the second level. Work on the third level will begin as soon as the second level is readied for field evaluation.

Hilda Caton and Eleanor Pester are responsible for this project. Eddy Jo Bradley is the directing editor. Eric Hamp is the linguist. The project is funded under a grant awarded to the American Printing House for the Blind by the federal Research in Education of the Handicapped Program's Field Initiated Research competition, which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, U.S. Department of Education.

#### Identification of Research Needs in Braille

**Purpose:** To review and evaluate existing research on braille and to identify deficit areas in which additional research is needed

The initial phase of this project was completed as a part of a project commissioned by the Braille Authority of North America. This phase included the reviewing and abstracting of studies related to the braille code only.

Subsequently, the project was expanded to include studies related to the braille code and studies related to the learning and reading of braille. Other studies which have a direct relationship to the development of Grade 2 braille were also included. The following activities were completed:

1. Searching of existing literature
2. Abstracting of articles identified through the search
3. Organizing the abstracts, chronologically, so that specific trends and/or gaps in research can be identified

Work completed during Fy 1986. During the period from July 1985 to June 1986 the following activities were completed:

1. A search of the literature for 1984 and 1985 was conducted so that new studies could be included.

2. Studies identified in this way were abstracted and added to the total bibliography.
3. A final computer search was initiated to attempt to find studies which were missed through other methods of searching.
4. Articles already abstracted were transferred to computer disks so that final editing could be done on the computer.

The projected completion date for this project was June 30, 1986. At the time, the initial draft of the bibliography (including a prioritized list of research needs in braille) was completed.

Hilda Caton compiled this bibliography and was responsible for identifying gaps in research representing research needs. The study was primarily funded by the Braille Authority of North America and was augmented by APH.

### Educational Measures

#### Braille Unit Recognition Battery

Purpose: To develop a comprehensive diagnostic test of the literary braille code

Work completed during FY 1986. Publication of this APH developed test and its manual took place during this period. The test battery has been well received and was favorably reviewed by Sharon Bradley-Johnson in her new book, Psychoeducational Assessment of Visually Impaired and Blind Students: Infancy through High School, published by pro-ed in 1986.

Hilda Caton and Bill Duckworth, who developed the battery, are well pleased by the response from the field.

#### Basic Reading Rate Scale

Purpose: To determine the feasibility of adapting Form A of the Basic Reading Rate Scale, by Miles A. Tinker and revised by Ronald P. Carver, for braille and, if feasible, publishing braille and large type editions

Work completed during FY 1986. Braille and large type editions of this scale, along with their directions for administration, were released early in 1986. Determination to publish a braille edition was based on field evaluation data. These data were found to be consistent with past research on braille reading rates. Publication of the large type edition followed normal procedures for such which include editing as needed and developing specific directions for administration. This scale provides a quick and



easy means of measuring reading rate and can be used with people from elementary grades through adulthood.

Bill Duckworth and Hilda Caton were responsible for this project.

#### Brigance Comprehensive Inventory of Basic Skills

Purpose: To adapt for braille administration this inventory which will enable evaluation of developmental and academic skills from prekindergarten to grade nine

Work completed during FY 1986. A tactile format for the supplement required for blind students to be evaluated with this inventory was determined and work initiated on it. Concurrently, an introduction to use of the supplement was written, as were special instructions or alternate activities for many of the activities included in the inventory. Activities not grade appropriate for blind students (e.g., motor skills) were retained for use as guidelines for the further development of a student's skills in the specific areas addressed. Labels will be provided to be placed on each page of the print edition (required for administration) telling what action should be taken; specifically:

1. Give evaluation as stated, modifying the language for the tactual learner.
2. Evaluation not suitable as written, turn to page \_\_\_\_ in the APH Supplement.
3. Evaluation is not appropriate for tactual learners [alternate activity suggested when possible].

Work planned for FY 1987. All supplemental test materials will be completed and prepared for production.

Bill Duckworth is responsible for the adaptation of this test.

#### New Educational Measures Identification

Purpose: To locate educational measures widely used in the field of education that are appropriate for adaptation for use by visually handicapped students

Work completed during FY 1986. Early planning for the year included a needs meeting for educational measures. Another approach, however, was implemented in the interest of economy. A request was made of readers of the APH Slate to name those tests and types of tests they feel would be most useful. This was done 3 years ago prior to a needs meeting and results coincided with those also suggested by leading psychologists in the field who attended the needs meeting.



Work planned for FY 1987. Major test publishers will be contacted and requested to name their academic tests with widest distribution. They will also be asked for suggestions as to adaptation in general. Also, a number of psychologists will be contacted individually for their thoughts. A tentative list of measures may be sent to several key people to obtain the type of information generated by a needs meeting.

Bill Duckworth is responsible for the identifications and prioritization of test needs.

#### Florida Statewide Assessment Tests

Purpose: To adapt the Florida competency tests for braille and large type editions to be used with visually handicapped and learning disabled students

Work completed during FY 1986. These tests were adapted in the spring and fall for grades 3, 5, 8, 10, and 11. A Teachers Certification Examination and a special edition of a test for mentally retarded students were also adapted.

Work planned for FY 1987. This work will be done yearly in cooperation with personnel of the State of Florida on a purchase order/contractual basis.

Bill Duckworth is responsible for this work.

#### Iowa Test of Basic Skills

Purpose: To fulfill a one-time contractual agreement with the State of Iowa through the Iowa Braille and Sight Saving School to provide braille editions of the Iowa Test of Basic Skills

Work completed during FY 1986. Form G was adapted for Levels 7 and 8 and Forms G and H were adapted for Levels 9-14. These adaptations were made on a one-time basis. The administration manuals are not being done by APH.

The answer sheets for Levels 9 through 14 were made by using Raised Dot Computing's BEX Program on a Cranmer Modified Perkins Braille in conjunction with an Apple //e. In this way the customer receives the computer disk and can print answer sheets as needed. This is especially good with braille tests in cases where questions are dropped without changing the numbering system as the answer sheets can reflect this.

Bill Duckworth was responsible for this work.

## Microcomputer Applications

### Third Microcomputer Advisory Meeting

Purpose: To identify and prioritize needs for educational materials to support use of microcomputers

Work completed during FY 1986. The Third Microcomputer Advisory Meeting was held October 3 and 4, 1985. The greatest needs identified at the meeting were:

1. finish products underway--  
Talking Apple Literacy Kit (TALK: //e)  
Minnesota Educational Computing Consortium's (MECC) Elementary  
Volume 1--Mathematics  
Sliwa Enterprises Inc. (SEI) software  
Speaking Speller  
Talking Typer  
Echo Commander  
Manuals
2. adapt and produce a talking version of Apple Computer's Appleworks  
(if the source code can be obtained) and package with MECC's  
Computing Tools: Appleworks manual.
3. develop speech guidelines to be used as a standard in adapting and developing talking software/coordinate with an enhanced version of Street Electronics' TEXTALKER/reprogram Apple's ROM chip for special uses by visually handicapped persons/develop a talking utility disk
4. continue to adapt MECC software in the areas of English, science, math, social studies, writing, and simple logic
5. write a program to instruct visually handicapped persons on how to use the Apple //e as a talking calculator (if a consultant can be found to do this)
6. compile and produce a disk of games
7. make an audio or disk version of an IBM manual, a manual on ProDOS, and any other manuals determined to be of need
8. produce a //c version of the Talking Apple Literacy Kit (TALK: //c)
9. produce a talking chess game (which had already been partially modified by Larry Skutchan)

Work planned for FY 1987. A fourth meeting of the Microcomputer Advisory Committee will be conducted in the fall of 1986 to review progress and determine additional microcomputer related products needed for use by visually handicapped individuals.

Debbie Willis is responsible for organizing and conducting meetings of APH's Microcomputer Advisory Committee.

Survey of Products Being Used and Products in Need of Development for Legally Blind Persons Using Microcomputers

Purpose: To determine the greatest needs of the field and set priorities appropriately by gathering up-to-date information on the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons

Initially, in order to determine the greatest needs of the field and set priorities appropriately, information regarding the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons was gathered during the fall and winter of 1983. As a result of the findings, initial efforts were targeted toward Apple and Echo products utilizing the DOS 3.3 operating system. Also, in order to get more specific information and guidance on a continuing basis, an advisory group was formed. Three microcomputer needs meetings were held with the advisory group at APH; the first was in August 1984; the second was in March 1985; the third was in October of the same year. As a result of these meetings, a list of greatest needs, moderate needs, and least needs was generated. Many of the greatest needs identified have been addressed by members of the Department of Educational Research at APH resulting in a new line of microcomputer related products for visually handicapped persons.

Work completed during FY 1986. This is a rapidly changing field. Dramatic changes have occurred since the initial survey due to a tremendous amount of effort, time, and money which has been poured into either making initial hardware/software/peripheral purchases or additional purchases to enhance/upgrade the computer education and general computer use across the country. Therefore, in order to have current information and thereby meet the greatest needs, a second survey was conducted.

A comprehensive 7-page questionnaire was developed and sent to a random selection of those individuals who had been identified by APH trustees as working in the area of microcomputers with legally blind students or clients. Approximately 200 of the 600 questionnaires sent were completed and returned. As a byproduct, but important in itself in developing a network of communication, was the acquisition of a list of people across the country who are currently working with blind persons using microcomputers.

Worked planned for FY 1987. The data will be recorded and analyzed and a final report written. The answers to the survey questions will provide the information needed to more effectively plan and develop necessary and appropriate products for use by blind persons using microcomputers.



The names and addresses of the persons who cooperated in completing the questionnaires will be added to an existing database of individuals actively involved in using microcomputers with legally blind persons.

Debbie Willis is responsible for this endeavor. Fred Otto will assist in recording the data. Bob Glass will enter the names and addresses of the respondents into the database.

### Survey of Preferences and Needs in Speech Enhanced Microcomputer Materials

**Purpose:** To survey preferences and needs in speech enhanced microcomputer materials and to develop programming recommendations for such materials

Work completed during FY 1986. Rapid advancements in the technology of synthetic speech for microcomputers have spawned a variety of software products impacting upon the visually handicapped. Systems of preference among the blind, such as Street Electronics' TEXTALKER program, are often applied to programs with little or no consistency of use from programmer to programmer. For example, one program may permit the user to review the contents of a screen line-by-line through the use of certain control commands, while another fails to recognize those same commands relying, instead, upon the use of up- or down-arrow keys. Still other programs or systems contain no review features at all. Such an absence of uniformity in speech software has fostered the current condition where users frequently are forced to learn many synthetic speech conventions on a program-by-program basis in addition to a program's other rules for use.

In an effort to ameliorate this condition, participants at the Third Microcomputer Advisory Meeting assigned a "critical need" priority to the establishment of industry-wide synthetic speech guidelines for use in development of microcomputer software. However, in view of the rapid advances taking place in synthetic speech technology, APH staff determined that any attempt to establish rigid guidelines at this point in time would have a regressive effect upon the technology. In deference to the Microcomputer Advisory Committee's recommendations, a project was begun to survey and document the preferences of visually handicapped users and educators of the blind with regards to the use of synthetic speech in programming, and to disseminate these findings on preferences.

Additional objectives of this survey were to gather specifications for an APH edition of the TEXTALKER program; to identify potential MECC titles for synthetic speech adaptation; to identify other speech-adaptable programs with high utility; to determine the need for and specifications of a talking calculator program; and, finally, to solicit further suggestions for needed microcomputer materials.

Criteria for placement in the subject pool of potential survey respondents were: (a) a totally blind individual who relied on a microcomputer as a major personal tool in his or her employment, education,



or daily affairs; or (b) a teacher of visually handicapped currently or recently involved with teaching microcomputer skills and applications; or (c) an individual who fit both categories.

Individuals placed in the subject pool were from an APH database of teachers, users, and administrators involved in microcomputer applications. Individuals have been added to this database over time for a variety of reasons; some are highly recommended by ex officio trustees, some have served as consultants, some are highly visible for their publications, some have been met in the course of field testing, workshop, or conference activities, still others are known consumers and dedicated users of specialized speech software.

The Microcomputer Advisory Committee recommended a survey approach of data collection. In view of the variety of speech related issues involved, the degree of detail needed on each issue, and additional constraints on time, a survey plan was approved by APH staff which called for a questionnaire to be mailed out to recipients in advance of a follow-up telephone interview.

Questionnaire items were drafted and revised in two separate research staff meetings. During those meetings, additional items were added which reflected immediate and long-term planning concerns of the research staff for additional microcomputer materials. The questionnaire underwent a pilot trial before it was disseminated and the final version with its cover letter was transcribed into braille for braille reading subjects.

Work planned for FY 1987. Findings will be grouped and compared between the three groups of blind users, teachers of the blind, and those individuals who are both blind users and teachers of the blind. After the results have been compiled, the findings will be circulated among the members of the Microcomputer Advisory Committee for additional review and comment.

Findings will serve as a basis for establishing preferences for the use of synthetic speech in microcomputer programs, to identify MECC programs most highly recommended for speech adaptation, to develop final specifications for the APH edition of the TEXTALKER program, to document the degree of need and specifications recommended for a talking calculator program, and to identify potential high priority needs for future microcomputer materials.

Bob Glass has been responsible for this project.

#### Talking Apple Literacy Kit (TALK): Apple //e Edition

Purpose: To evaluate and revise the familiarization materials included in the Talking Apple Literacy Kit (TALK): //e Edition for use by teachers introducing the microcomputer to blind students/clients

Work completed during FY 1986. The components of the TALK: //e were tested for legibility in the summer of 1985. Following the evaluation, the materials were revised as needed and the teacher's guidebook was completed.

During the early part of 1986, the TALK: //e materials entered the production pipeline of APH. As the first entry by APH into the realm of software publication, the TALK materials also served as the stimulus for developing and coordinating various production resources into an ongoing process for the production of all future software titles. For example, as production of the TALK materials progressed, related efforts yielded a talking software logo for the binder cover and software banner page, a standard 3-ring binder for all future documentation and software, a method of labeling disks in braille and print, methods for mass production of disks, construction of a specialized warehouse area for disk storage, fabrication of shipping containers, and a company policy on warranty, replacement, and unauthorized copying.

Work planned for FY 1987. Production of the TALK: //e will be completed and released in late summer of 1986.

Bob Glass, Debbie Willis, and Larry Skutchan were responsible for the successful completion of this project.

#### Talking Apple Literacy Kit (TALK): Apple //c Edition

Purpose: To develop a set of basic familiarization materials for use with an Apple //c to be used by teachers introducing the microcomputer to blind students/clients

Work completed during FY 1986. As the Apple //c microcomputer has increased its presence in the marketplace as an inexpensive and powerful alternative to the Apple //e, participants in the Third Microcomputer Advisory Meeting strongly recommended the development of a Talking Apple Literacy Kit for the //c. The //c Edition differs from the //e Edition only in two small areas: the styrene model of the keyboard and the programming related to TEXTALKER on the Talking Writer.

Preliminary work on the keyboard model was begun and Mark Cross (Cross Educational Software, producer of the Talking Writer) started making specified programming changes. However, results of the survey on products being used and products in need of development will strongly influence APH's decision to produce the TALK: //c.

Work planned for FY 1987. Results of the survey on products being used and products in need of development will be analyzed. If the survey results indicate a need for a //c kit, it will be prepared for production during FY 1987.

Debbie Willis, Bob Glass, and Larry Skutchan are responsible for this project.

## MECC Software

Purpose: To adapt widely used educational software distributed by MECC

Work completed during FY 1986. After reviewing the handful of APH Software Evaluation Forms returned in a quest for information about useful or needed software, it was determined that the most requested piece of MECC software to be adapted was Elementary Volume 1--Mathematics. After being reviewed it was decided that the concepts being taught in the programs on this disk could be conveyed through a speech-adapted version and that the reprogramming necessary for a speech-adapted version could be done. Permission was sought and obtained from MECC to produce and distribute an adapted version of Elementary Volume 1--Mathematics for use by visually handicapped persons.

While 2 of the 11 programs on the disk, CHANGE and METRIC 21, caused particular problems, the modifications were completed in the summer of 1986. The original MECC manual and an APH supplement to the manual will accompany the software.

As work progressed on the speech-adapted version of MECC's Elementary Volume 1--Mathematics, more of MECC's programs were reviewed. Two more programs, Elementary Volume 4--Math/Science/Astronomy and Adventures with Fractions were selected for adaptation even though some of the programs on each of these disks could not simply be speech-adapted. Some type of tactile diagrams and/or aids would have to be designed to accompany these programs. Again, permission was sought and granted by MECC for APH to modify these two programs.

APH has also endorsed and sought permission from MECC for a project being done by Bruce McClanahan and a programmer at Iowa Education Agency 6 in Marshalltown, Iowa, to modify several selections of MECC software. These modified MECC software programs would be made available only to teachers of the blind in the state of Iowa. However, the modifications made will also be submitted to APH. APH could use these modifications, if desired, in making an APH talking version available for use by all legally blind persons. Permission to do so would have to be obtained from MECC.

Participants in both the Second and Third Microcomputer Advisory Meetings assigned high-priority status to the development of speech-adapted software from MECC. This challenge was particularly noteworthy because MECC materials were developed by educators and include a vast collection of titles readily available to hundreds of school systems nationwide. Additionally, many of the programs are designed for primary and elementary level students.

The strong initial appeal of this project, however, has been frustrated by the realities of programming requirements and limitations of current speech technology. Many of the MECC materials are written in programming languages that are not supported by TEXTALKER and some, which are written in compatible language, are highly graphic in nature. The most easily adaptable MECC materials are from its earliest endeavors in software



development. Unfortunately, many of these programs are characterized by an unsophisticated and inefficient approach to programming. Problems in identifying suitable titles for adaptation have been further compounded by the lack of specific recommendations from the field by teachers of the blind actually attempting use of the materials with their students.

Work planned for FY 1987. The APH talking version of Elementary Volume 1--Mathematics will be sent to MECC for approval and will be turned over to APH's Production Department. This program should be available in the fall of 1986.

The results of the Survey of Preferences and Needs in Speech-Enhanced Microcomputer Materials will be examined to determine whether specific selections of MECC software have been identified for adaptation. These results will be combined with the reviews done by others for direction in modifying future selections. The MECC programs adapted by Bruce McClanahan will also be reviewed and considered for APH versions. Permission to modify additional MECC software will hopefully be obtained during this fiscal year. A decision concerning whether to design a tactile aid to accompany the programs on the stars on Elementary Volume 4--Math/Science/Astronomy or to only speech-adapt the math/science programs on the disk will be made.

Debbie Willis is responsible for selecting the MECC software to be adapted and for seeking permission from MECC for APH to produce adapted versions of their software. Debbie Willis and Bob Glass will be responsible for redesigning the programs to be modified. Larry Skutchan will be responsible for reprogramming the changes necessary for the speech-adapted programs and for writing brief APH supplements to MECC's manuals, as needed. They have been assisted by Suzette Wright and Craig Trefney, a graduate student from Boston College, who worked on this project while doing a 4-week practicum at APH during the spring of 1986.

### SEI Software

**Purpose:** To adapt educationally sound, commercially available software for use by visually handicapped persons

At the Second Microcomputer Advisory Meeting, it was strongly recommended that APH explore the possibility of modifying the popular SEI educational software series. APH is pleased to announce an arrangement with SEI for a customized edition of these programs which is even simpler to use than the original series. Without any computer experience, both students and teachers can use the adapted APH/SEI software. The content of each disk is appropriate for use by high school and college students, as well as adults. Initially, APH will be offering the following 33 SEI titles:

- Afro-American Literature
- American History I
- American History II
- American History III

American History IV  
American Poetry  
Ancient Civilization  
Asian/African History  
Dickens  
Early American Literature  
Edgar Allen Poe  
European History I  
European History II  
Fantasy  
Foreign Governments and the United Nations  
High School Literature I  
High School Literature II  
High School Literature III  
History of Space Flight  
Mark Twain  
Modern British Literature  
Mystery  
Mythology  
Science Fiction  
Sentence Completion  
Shakespeare I  
Shakespeare II  
Short Story  
Steinbeck/Faulkner/Hemingway  
U.S. Government  
Vocabulary Builder  
Women Authors  
Word Analogy

These can be run on any of the Apple // family of microcomputers with at least 64K of memory. An Echo II, Echo+, Echo Cricket, or Echo Commander must be attached for speech output.

Work completed during FY 1986. The programs were reviewed and corrections needed identified and made.

Work planned for FY 1987. Instructions and a reference card for using the APH/SEI talking software will be prepared. Beginning in late summer, two to four selections will periodically enter APH's production pipeline. These programs will be available for use early in 1987.

Debbie Willis is responsible for this project.

### Speaking Speller

**Purpose:** To develop a user-friendly spelling program

Work completed during FY 1986. A recommendation resulting from the Third Microcomputer Advisory Meeting was that the spelling program which appeared on the TEXTALKER disk that came supplied with the old Echo II

synthesizer from Street Electronics be modified and distributed by APH. Evaluation of the program revealed it was full of bugs and not very friendly. Rather than attempting to "fix" it, a decision was made to rewrite the program. The result is Speaking Speller.

Speaking Speller is a program which permits teachers to create and store lists of spelling words for use by students in a practice or testing situation. Speaking Speller's code and documentation were written and turned over to production. The program should become available during the fall of 1987.

Work planned for FY 1987. This project is complete and future upgrades to the software will be dictated by responses from the field.

Larry Skutchan headed this project.

### Talking Typer

Purpose: To provide students/clients and teachers with appropriate software and documentation for use in teaching/learning with computers

Work completed during FY 1986. At the Second Microcomputer Advisory Meeting, a typing program called Kids Can! Typer, developed by Ted Hasselbring and Carol Hamlett for sighted special education students, was demonstrated and discussed. The committee gave a speech-adapted version of this program a high priority. Phyllis Brunken, although not able to attend the second meeting, had seen the Kids Can! Typer program demonstrated extensively and wrote a letter in strong support of a speech-adapted version. After negotiating with Dr. Hasselbring and Miss Hamlett, it was decided that APH could acquire complete marketing rights to the speech-adapted version. Carol Hamlett agreed to make the necessary programming changes.

A meeting to determine the significant changes to the program was held. Prior to the meeting, Carol Hamlett had speech-adapted a segment of the Kids Can! Typer and it was sent out for review and critique. Resulting suggestions and points to consider were discussed at the meeting.

During the year, Carol Hamlett sent six partial versions of the modified typing program, Talking Typer, for review and critique. LaRhea Sanford wrote the files to be included on the typing program. She and another teacher also used the modified program with a few of their visually handicapped students as the program was being developed so that changes could be implemented throughout various stages of the adaptation. The student and teacher disks and accompanying manual neared completed.



Work planned for FY 1987. The student disk, teacher disk, and accompanying documentation will be completed. These will be reviewed and critiqued by in-house staff and two typing instructors. The necessary modifications will be made. The final version of Talking Typer will be turned over to the Production Department in the fall of 1986.

Debbie Willis worked with Carol Hamlett in redesigning and reviewing each modified segment of this typing program. Larry Skutchan assisted on this project.

#### TEXTALKER

Purpose: To incorporate features specifically recommended by blind users into the TEXTALKER software

Work completed during FY 1986. During discussions of greatest needs, members of the Third Microcomputer Advisory Committee recommended some changes to the TEXTALKER software. When advisory committee members recognized their inadequacy to provide specific suggestions and recommendations, several sources provided ample information for change. These included responses from APH's speech survey, requests from users which Street Electronics's files contained, and independently conceived ideas. The result of the gathering of this information and the implementation of the suggestions is a speech access program that increases the experienced TEXTALKER user's productivity and reduces the new user's frustration. For the first time, the design of the program respects the blind user's needs and more fully meets his or her requirements.

One feature, the ability to silence the speech with any keystroke, seems so popular that program testers refuse to use the old version. Other enhancements installed include the ability to define windows for examining material displayed in columns with speech, a repeat character filter which prevents the user from hearing decorative menu borders, and decreased dependence on critical system memory locations.

Work included making all program changes and writing a user's guide to the new program. TEXTALKER version 3.1.1 was turned over to production and should become available during the fall of 1986.

Work planned for FY 1987. This project is complete and no further work is anticipated. Comments from the field will determine when future upgrades will be required.

Larry Skutchan headed this project and provided programming and documentation.

### Echo Commander

Purpose: To provide a flexible speech synthesis control system for the Apple

Work completed during FY 1986. Research staffers modified Echo speech synthesizers for personal use. The modifications included complete control of the synthesizer's volume and rate of speech through two control knobs mounted on an external box. The box also contains earphone and external speaker jacks.

The adaptations proved quite exciting to every visitor observing the new synthesizer control system and negotiations with Street Electronics yielded an agreement for them to supply boards manufactured to APH's specifications. Extensive testing and quality control procedures were undertaken that result in a control unit that meets the needs of Echo users, except for the //c user. (APH's recognition of the huge number of existing Echo II and Echo+ units resulted in the production of two separate products in this series; the complete system, including the Synthesizer card, and one for those users already utilizing an adequate card, which contains only the attachment unit.)

Work planned for FY 1987. As the first test units proved functional in every respect, no further modifications were required. The Echo Commander will become available during the latter half of 1986.

Larry Skutchan and Jim Robinson, a Manufacturing Specialist in APH's Project Department, have been responsible for this project.

### Speaqualizer

Purpose: To produce a speech synthesis system for IBMs

Work completed during FY 1986. After negotiations and consultation with the Third Microcomputer Advisory Committee and with the research and development committee of the National Federation of the Blind (NFB), APH and NFB agreed on an interesting new partnership. The committee's recognition of IBM's increasing prevalence in the work force and NFB's continuing excellent research spawned the Speaqualizer.

The Speaqualizer is completely hardware driven so that no software is required to operate the system; as soon as the computer is turned on, the Speaqualizer begins speaking. This is the most transparent form of speech technology currently available. In other words, the Speaqualizer works with nearly any commercially available program. The Speaqualizer makes more commercial programs accessible than any other system currently on the market.

Work planned for FY 1987. Price estimates and manufacturing facilities will continue to be investigated and APH is expecting to have production



models available during the early part of 1987. Continuing enhancement of the system will be provided by APH staff.

Larry Skutchan coordinated negotiations and Bob Phelps, Project Manager of APH's Project Department, investigated manufacturing and production facilities for this project.

### Talking AppleWorks

Purpose: To adapt AppleWorks for speech output

Work completed during FY 1986. In an effort to provide blind children exposure to programs utilized by their sighted classmates, members of the Third Microcomputer Advisory Committee recommended investigating the feasibility of adapting the AppleWorks program for speech. (Appleworks is a popular program for the Apple which features integrated database, spreadsheet, and word processing.) Committee members recognized that two of these kinds of programs, spreadsheets and database management systems, clearly were weak areas in the talking Apple software community.

The AppleWorks project progressed slowly but continuously. Although a request was made of Apple for permission to obtain the source code to this program, a problem arose because AppleWorks was developed by an independent programmer so Apple's otherwise complete cooperation with APH's requests and suggestions was compromised.

With Apple being unable to provide the source code to AppleWorks, the feasibility of the project came into question. After disassembling the program, it was learned that AppleWorks uses absolutely no conventions or other built-in routines which TEXTALKER, the speech software, requires. (It turns out that AppleWorks was originally written for the Apple III computer and was called 3 Easy Steps.) Several problems were skirted by writing a patch which was installed into a small area of free memory then fooled AppleWorks into thinking the machine contained only 64K of RAM. (This prevented AppleWorks from overwriting TEXTALKER, the speech software, with other information.)

Although successful in installing speech into the AppleWorks system, the results were less than satisfactory. Resolving the conflicts with where TEXTALKER expects to find critical screen and system information with where AppleWorks actually stores it requires major modifications to both programs.

If AppleWorks, in a talking edition, could benefit the blind user, other than for purely cosmetic purposes, modifications would resume immediately. The critical problem involves the program's very design. AppleWorks is visually oriented. It displays layers of menus that look like file cards, providing the user with any possible information he may ever need. Unfortunately, such a design is not compatible with speech output; the user quickly grows tired of the recital of every menu choice. This problem could be skirted by selectively pronouncing menu items and other



program information but, due to the program's design, even this seems a monumental task without the benefit of the source code.

Work planned for FY 1987. The amount of time required for such changes weighed against the usefulness of this system seem depressingly obvious. While APH recognizes the extreme desirability of such a program, evidence points to the conclusion that, even though program execution wouldn't be exactly the same, independently developed programs of this type would more admirably serve the needs of the blind.

Changes that could make this a viable system require a complete redesign of the program. Without further recommendations from the Microcomputer Advisory Committee or more cooperation from Apple on this matter, the project will be discontinued.

Larry Skutchan provided programming skills for this project.

#### Teacher's Pet

Purpose: To produce a testing program

Work completed during 1986. Larry Skutchan developed a program called Teacher's Pet which he has donated to APH. The program permits teachers to enter questions and answers into the computer and store them on disk for later use by students. Minor modifications to the program's documentation will be required.

Work planned for FY 1987. The needed modifications to the program's documentation will be made after which the product will enter APH's production pipeline. Future enhancements to Teacher's Pet will be determined by user responses.

Larry Skutchan is responsible for this project.

#### APH Modified Talking Sensible Speller

Purpose: To produce a talking spell checker

Work completed during FY 1986. Sensible Speller is a spell checking program which runs on the Apple computer that was developed by Sensible Software. The company produced a talking version of the Sensible Speller earlier in the year but it was completely unacceptable. After obtaining a production copy, it was modified to function more smoothly with speech.

Negotiations and specification arrangements with Sensible Software resulted in the company producing a modified version of the Talking Sensible Speller for distribution through APH. These modifications provide the user with a much faster and friendlier interface to the Sensible Speller system.

Work planned for FY 1987. APH expects to begin offering the APH modified Talking Sensible Speller during the first half of 1987.

Larry Skutchan took responsibility for this project.

#### Utilities Disk

Purpose: To produce a utilities disk

Work completed during FY 1986. In response to committee suggestions that a utilities disk containing most often needed utilities be provided by APH, work on such a disk was initiated. Such a utilities disk will provide both the teacher and student with reliable talking software to perform important disk maintenance operations.

APH requested and received permission from Apple Computer to modify the source code to two of its utility programs. Preliminary work on these two projects was undertaken. Several other programs that comprise the utilities disk, however, were completed.

Work planned for FY 1987. After completing the revisions to the two programs from Apple, little else remains for this project.

Larry Skutchan is responsible for the utilities disk project.

#### Calculator Program

Purpose: To determine the need for and specifications of a talking calculator program

Work completed during FY 1986. The members of the Third Microcomputer Advisory Meeting conditionally recommended the development of a talking calculator program, if the programming tasks were subcontracted. The intent of this conditional recommendation was to involve APH staff as little as possible in time-consuming programming tasks in order to free the time for equally or more pressing concerns which could not as easily be subcontracted. The staff identified and made preliminary contact with S-C Software of Dallas regarding the programming duties.

A survey was begun to determine the need and specifications of a talking calculator program. Preliminary results indicated that the greatest needs for calculating software were primarily in the areas of business and scientific calculations. A major specification of the program, regardless of its functions, is a high degree of transparency. Accordingly, the value and need for such a program are directly related first to its transparency and secondly to its cost.

Work planned for FY 1987. Additional specifications will be determined by advisory committee review and presented to S-C Software for a quote on programming costs. A decision will be made on whether or not to proceed when more information is available.

Bob Glass has been responsible for gathering data on program specifications, while Larry Skutchan has had the responsibility of identifying and establishing contact with outside programmers.

### Talking Games Volume One

Purpose: To produce a disk of public domain games accessible through speech synthesis

Work completed during FY 1986. The Microcomputer Advisory Committee suggested compiling a few disks of public domain games which worked with speech. One complete disk and parts of two others were compiled. In many cases, instructions, as can be expected in public domain material, are inadequate or nonexistent.

Work planned for FY 1987. Instructions will be developed for games as needed and games from the public domain will continue to be reviewed and the best will be compiled into future volumes. APH's policy regarding distribution of public domain software will be reviewed.

Larry Skutchan was responsible for this project.

### Talking Sargon II

Purpose: To produce a talking chess game

Work completed in FY 1986. Larry Skutchan previously modified the Sargon II chess game for the Apple II and has donated his program to APH. An attempt has been made to obtain permission from Hayden Software, the program's manufacturer, to market this version of Sargon II.

Work planned for FY 1987. APH will continue its attempt to obtain this permission.

Larry Skutchan has been coordinating this project.

### Manuals

Purpose: To provide audio versions of commonly used publications relative to microcomputer use

Work completed during FY 1986. As recommended at the Third Microcomputer Advisory Meeting, an IBM manual was selected for transcription into audio form on cassette tape. The manual recommended by Frank Irzyk and reviewed by



members of the research staff was Running MS-DOS. Written permission was received from the publisher, Microsoft Press, to reproduce Running MS-DOS on cassette tape for use by visually handicapped persons. After receiving permission, the manual was recorded, proofed, and corrected. As a result of recording this manual, some preliminary guidelines for reading computer manuals were drafted.

It was also recommended that an Apple manual on ProDOS be transcribed into audio form on cassette tape. Since APH is also considering production of a //c version of the Talking Apple Literacy Kit, both the Apple // ProDOS User's Manual and Apple //c Owner's Manual were selected for transcription into audio form. Approval was received from Apple Computer's Office of Special Education to record these two manuals for use by visually handicapped persons.

Work planned for FY 1987. Copies of Running MS-DOS will be duplicated on cassettes and put into APH stock. The Apple // ProDOS User's Manual will be proofed and corrected. Copies will be run on cassettes and put into stock. The guidelines for reading computer manuals will be revised if necessary after proofing this manual. They will then be submitted for publication. The Apple //c Owner's Manual will be read, proofed, and corrected. Copies will be run on cassettes and put into stock.

Debbie Willis reviewed the manuals and sought permission to make them available through APH on cassette tape. Larry Skutchan and Debbie Willis drafted the preliminary guidelines for reading computer manuals and will share responsibility for proofing the audio versions of these manuals. Larry Skutchan will revise the guidelines for reading computer manuals and submit them for publication.

#### ASCII Text Files of Apple Manuals

Purpose: To offer popular Apple technical manuals in disk form

Work completed during FY 1986. Preliminary discussions with representatives of Apple Computer resulted in an offer from Apple to supply the ASCII text files of any of their manuals for editing and dissemination by APH. After certain legalities with Apple were completed, the first text file, The Apple //c Owner's Manual, was received in early June. The significance of this gesture resides in the fact that an individual possessing the ASCII text of any work has the ability to output that information in print, hard braille, refreshable braille, synthetic speech, and/or large type.

Work planned for FY 1987. Since graphic information is absent in these text files, editing for the purposes of describing illustrated information must be completed. Additionally, a "manual-reading" program will be developed to enable quick access of selected topics. Implications for future technical and nontechnical literature in ASCII text form will be examined.

Bob Glass and Larry Skutchan are working on this project.

### PocketBraille

**Purpose:** To develop a portable, electronic, braille note-taking device with built-in speech synthesis and to develop related software and hardware

Work completed during FY 1986. Since its introduction, the Perkins Brailier has become the standard by which other braille writing devices are measured. However, user satisfaction with the Perkins is limited by a number of factors, among which are its size and weight, its high level of noiseness, and the availability of repair services and spare parts, especially outside the United States. In 1985, the Kentucky Department for the Blind developed and released technical drawings and a small number of working prototypes of a device named the Kentucky PocketBraille.

The PocketBraille is a small, battery operated, portable computer with 256K of memory and a seven-key, braillewriter style keyboard. Built into its design is a standard RS 232 interface with both serial and parallel port connections which enable the device to output directly to most printers, braille embossers, refreshable braille displays, the VersaBraille, synthetic speech devices, modems, and/or other computer systems compatible with RS 232 interfacing. In other words, the PocketBraille is compatible with nearly every computer system.

Additionally, the RS 232 design permits the flow of data into the PocketBraille from an outside source such as a telecommunications network or another microcomputer. The present design of the PocketBraille includes built-in synthetic speech circuits and a small speaker. The device accepts input in any braille code.

The PocketBraille dimensions are 7 inches x 4 inches x 1 inch and its weight is less than 18 ounces. Since the seven key switches and on/off switch are the only moving parts, the PocketBraille is nearly silent and virtually maintenance-free. Its applications range from a portable note-taking device, to a text editor; from a lightweight reading machine, to a daily electronic newspaper.

After the Kentucky Department for the Blind expressed its interest in cooperating with APH in refining and improving the original PocketBraille design, a formal research and evaluation plan was developed and implemented. Initial design changes focused on keyboard access and the utilization of silent switches, easily expandable memory options, an optional refreshable braille display, and programs built in as firmware for word processing and calculating. Preliminary cost estimates indicated that an APH PocketBraille could be constructed and sold within a \$600-\$700 price range per unit and, consequently, production of the first 100 units was approved.

An APH PocketBraille File Transfer Utility program was nearly completed which will permit the fast and efficient transfer of data between the PocketBraille and a computer. Another important development which occurred was the development of increased storage capacity for the PocketBraille. A matchbox-sized adapter now permits the storage of five megabytes (or five million characters) onto a standard 90-minute cassette in the APH Cassette Recorder/Player.

Work planned for FY 1987. PocketBraille technology is imminently suited to future expansion and refinement. Programming of the software for file transfer and the firmware for word processing and calculating will be completed as well as the owner's manual and other supporting documentation.

The project has involved a team of staff members from several departments. Larry Skutchan is responsible for software and firmware programming, Bob Phelps is overseeing the construction of prototypes and production models, and Bob Glass is responsible for documentation and reporting.

#### Math Decathlon and Printer Choices

- Purposes:
1. To provide teachers with appropriate software and documentation for use in teaching with computers
  2. To provide teachers and their visually handicapped students with appropriate materials needed to enable students/clients to access and use microcomputers and necessary peripherals

Work completed during FY 1986. At the Second Microcomputer Advisory Meeting, David Hauck demonstrated a public domain software program, Math Decathlon, that he had modified for Echo accessibility, and a utility program, Printer Choices, he had written to allow large print output to Apple compatible dot matrix printers. Mr. Hauck offered to give these two programs to APH to market. The committee assigned a high priority to pursuing these programs from David Hauck.

After careful review by research staff in which several "bugs" were discovered in these programs, it was decided that they were valuable programs and would be worth the time necessary to debug and write accompanying documentation. An official letter requesting permission for APH to market the programs was sent to Mr. Hauck. Mr. Hauck replied saying he had decided to copyright and market the programs himself.

Debbie Willis was responsible for working with David Hauck on this project.



## Other Research

### Academic Study on State Minimum Competency Testing Programs

**Purpose:** To determine if legally blind students in academic programs are performing at the same level as their sighted peers

Following a telephone survey of the 50 states and the District of Columbia, it was found that 12 states and the District of Columbia required minimum competency testing programs that included the testing of visually handicapped students in both public and residential schools. Although the tests varied from place to place, all included reading and arithmetic components. Late in FY 1985, questionnaires were developed for reporting comparable data for regular students, for legally blind students using large type or print, and for students using braille. Data for the latter two categories were to be reported separately for students enrolled in day school and residential school programs. At the end of the last year, five states had responded.

Work completed during FY 1986. An effort was made to collect the needed information from all parties to whom the questionnaire was sent. These were sites that had agreed to participate in the study during the previously mentioned telephone interview and that had indicated they had the data subsequently requested on the questionnaire. Unfortunately, the information was not forthcoming. One reason given was that the information did not exist in the format requested. It was with regret this project had to be terminated.

Work planned for FY 1987. A final report on this project will be prepared. Its emphasis will be on the minimum competency data that were compiled during the telephone survey.

Bill Duckworth was responsible for the effort made and will prepare the final report.

### Analysis of the 1985 Registration Data

**Purpose:** To describe the legally blind population registered through the American Printing House for the Blind

Work completed in FY 1985. The 1985 registration was not completed until late in the calendar year. The total number of legally blind students registered through APH for 1985 was 45,221. This represents an increase of 37% over the number registered in 1979, when this analysis was last performed. The Printing House's Data Processing Department was able to provide computer time and staff support for the analysis beginning in the April to June quarter of 1986. Working jointly with the educational research staff, omissions, irregularities, and errors in reporting of the data were addressed before attempting cross-analyses of the information. The extent of these irregularities necessitated considerable hand checking of over 2,000 individual reports and prompted preliminary cross-analyses of

reported age and grade placement, as well as age and reading medium for every student. Two to three percent of the reports were questioned due to apparent disagreements between age and grade placement.

Work planned for FY 1986. Research staff will finish examination of the data, completing placement of all reported information into accepted categories, and eliminating reports containing data which cannot be classified in these categories or which are incomplete. Cross-analyses relating information on school systems or agencies (4 categories), grade placement (20 categories), visual acuity (10 categories), reading medium (5 categories), and student age will be completed. In addition, the study will include the results of a questionnaire distributed in the spring of 1986. The questionnaire collected information about summer programs being conducted at residential schools and the numbers and types of students receiving some of their education from programs other than the ones through which they are registered.

Suzette Wright is conducting the study.

#### Future Trends in the Education of Blind Persons

Purpose: (a) To obtain information to use in planning for APH,  
(b) to obtain information to use in planning APH's research program, and (c) to obtain information to use in a program for APH's 1986 Annual Meeting

Work conducted during FY 1986. In January 1986 letters were sent to 25 persons, representing a variety of programs, who were selected because they were, or recently had been, in positions enabling them to have a broad perspective of the field of education for the blind. The letter sent to each was an unstructured query for ideas about future trends in the education of blind persons--specifically 5 years from that time. Using the Delphi Method to refine and estimate the relative impact of the various trends envisioned, a questionnaire was developed based on the initial input and sent to 35 persons--an expanded group that included the respondents to the original query. The questionnaire included 138 statements each of which was followed by a 7-point likelihood scale and a 7-point desirability scale. Responses were received from 89% of the recipients of the questionnaire.

Work planned for FY 1987. Data from the questionnaire will be analyzed. They will be used for the planning purposes indicated and as a database of information for a special program on Future Trends in the Education of Blind Persons to be presented at APH's 1986 Annual Meeting. Presenters will be invited to develop scenarios, based on information from the study, for Day Schools and Integrated Programs, Residential Schools and Integrated Programs, Technology and Materials, and Personnel Preparation. A formal report of the study will be prepared including information from the Annual Meeting.

June Morris was responsible for the study. She was joined in it by Paul Lewis, Supervisor of the Florida Instructional Materials Center.

## The World Book Year Book 1984 and 1985, Recorded Edition

Purpose: To provide a third yearbook combining information for 2 years to update The World Book Encyclopedia, Recorded Edition

Work completed during FY 1986. During the summer of 1985 a number of tasks were accomplished in preparation of this reference work for production. These included (a) editing the copy for recording, (b) preparing copy for the written indexes, (c) providing information for cassette labels, and (d) rewriting the instructions for greater clarity. At this time, APH is not planning to produce any additional combined yearbooks as the main volumes of the encyclopedia are becoming outdated and the use of a series of yearbooks is unwieldy.

Four graduate students from the University of Louisville's English Department (Patty Cambron, Fred Otto, Jane Webb, and Jean Woodworth) spent 705 hours on these tasks. They worked under the general supervision of June Morris who also coordinated the various production activities required for provision of this product.

## Portable Plus Record Player

Purpose: To evaluate the design and reliability of APH's new Portable Plus Record Player

Work completed during FY 1986. The Portable Plus represents a major advance in reading tools for the blind. In addition to traditional Talking Book player features, this lightweight unit is battery powered, has standard and variable speed controls, and contains a fully integrated speech compression circuit which permits the user to listen in compressed speech to external sources such as the APH Cassette Recorder/Player.

Eight Portable Plus prototype units and a draft of the Owner's Manual were used to begin a field evaluation which ultimately involved 16 subjects and three agency settings. The Louisville Regional Branch of the National Library Service for the Blind and Physically Handicapped served as the primary site for contacting subjects for this evaluation. Preliminary responses were overwhelmingly positive and user suggestions have been most constructive.

The Portable Plus was primarily developed by James Robinson, a Manufacturing Specialist in APH's Production Department. Tom Poppe designed its case. Larry Skutchan and Bob Glass have been involved in writing the Owner's Manual, and Bob Glass was responsible for the player's field evaluation.



Agencies Participating in Research during FY 1986

In addition to the agencies named here, appreciation is also extended to the many other agencies which cooperated with APH's research efforts by permitting members of their staffs to serve as consultants or respondents to requests for information.

Apple Computer, Inc.; Cupertino, California  
Area Education Agency 6; Marshalltown, Iowa  
Berks County Intermediate Unit; Reading, Pennsylvania  
Cross Educational Software; Ruston, Louisiana  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
The Greater Pittsburgh Guild for the Blind; Bridgeville, Pennsylvania  
Iowa Braille and Sight Saving School; Vinton, Iowa  
Jefferson County Public Schools; Louisville, Kentucky  
Kentucky Department for the Blind; Frankfort, Kentucky  
Kentucky Rehabilitation Center for the Blind; Louisville, Kentucky  
Kentucky School for the Blind; Louisville, Kentucky  
Leawood Elementary School; Columbus, Ohio  
Metropolitan Nashville Public Schools; Nashville, Tennessee  
New Mexico School for the Visually Handicapped; Alamogordo, New Mexico  
Pinellas County Schools; St. Petersburg, Florida  
South Carolina Commission for the Blind; Columbia, South Carolina  
Texas School for the Blind; Austin, Texas  
Thomas Jefferson Elementary School; Bristol, Virginia  
Visually Impaired Preschool Services; Louisville, Kentucky  
Visually Impaired Program; Orangevale, California  
Weber City Elementary School; Weber City, Virginia  
West Suburban Special Education Association; Lombard, Illinois  
Wisconsin School for the Visually Handicapped; Janesville, Wisconsin

Consultants during FY 1986

Braille Language Program

Dr. Samuel C. Ashcroft, Professor Emeritus, Peabody College, Vanderbilt University, Nashville, Tennessee

Mrs. Helen Berry, Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Mrs. Debbie Mullarkey, Teacher of the Primary Visually Handicapped, Leawood School, Columbus, Ohio

Mrs. Mary Powers, Consultant for the Visually Handicapped (Retired), South Carolina State Department of Education, Columbia, South Carolina

Mrs. Sara Spivey, Teacher (Retired), Cobb County Schools, Marietta, Georgia

Teacher Evaluators

Ms. Robin Boyd, Teacher, Thomas Jefferson Elementary School, Bristol, Virginia

Ms. Emily Fitzpatrick, Teacher, Weber City Elementary School, Weber City, Virginia

Mrs. Jean Randles, Kindergarten Teacher, Kentucky School for the Blind, Louisville, Kentucky

Braille Readiness Program

Teacher Evaluators

Miss Patty Dilg, Kindergarten Teacher, Kentucky School for the Blind, Louisville, Kentucky

Mrs. Debbie Mullarkey, Teacher of the Primary Visually Handicapped, Leawood Elementary School, Columbus, Ohio

Mrs. Jean Randles, Kindergarten Teacher, Kentucky School for the Blind, Louisville, Kentucky

Ms. Andrea Slavin, Teacher, Visually Impaired Program, Orangevale, California

Early Childhood Education Materials Needs Assessment Meeting

Mrs. Nancy Akeson, Teacher (Retired), Variety Club for Blind Babies Foundation, San Francisco, California

- Mrs. Elaine Baldrige, Supervisor, Foundation for Blind Children, Scottsdale, Arizona
- Dr. Vivian Correa, Assistant Professor, University of Florida, Gainesville, Florida
- Ms. Diane Crowell, Social Worker/Parent Counselor, Foundation for Blind Children, Scottsdale, Arizona
- Mrs. Diana Cuthbertson, Federation for Children with Special Needs and National Association for Parents of Visually Impaired Children, Boston, Massachusetts
- Mr. Fran Dibble, Teacher, Oakland Public Schools, Oakland, California
- Mrs. Betty Dominguez, Director, New Mexico Preschool for the Visually Handicapped, Alburquerque, New Mexico
- Dr. Kay Ferrell, National Consultant in Early Childhood, American Foundation for the Blind, New York, New York
- Mrs. Jay Greeley, Teacher, Anchor Preschool for Visually Impaired Children, Denver, Colorado
- Ms. Patrika Griego, Teacher, New Mexico Preschool for the Visually Handicapped, Alburquerque, New Mexico
- Dr. Verna Hart, Professor, University of Pittsburgh, Pittsburgh, Pennsylvania
- Dr. Phil Hatlen, Professor, San Francisco State University, San Francisco, California
- Mrs. Debbie Hatten, Teacher, University of North Carolina Infant/Preschool Program for Visually Impaired Children, Chapel Hill, North Carolina
- Mrs. Donna Heiner, Secretary, International Institute for Visually Impaired Children, Birth-7 years, Lansing, Michigan
- Mr. Chuck Marshall, Dean, Hadley School for the Blind, Winnetka, Illinois
- Mrs. Irma Marshall, Teacher (Retired), Seattle, Washington
- Mr. Tom Miller, Supervisor, Perkins School for the Blind, Watertown, Massachusetts
- Ms. Pauline Moor, Preschool Consultant (Retired), New York, New York
- Dr. Sandy Parsons, Assistant Professor, University of South Carolina, Columbia, South Carolina
- Mrs. Sherry Raynor, President, International Institute for Visually Impaired Children, Birth-7 years, Lansing, Michigan



Mrs. Susan Recchia, Infant Specialist, Blind Children's Center, Los Angeles, California

Ms. Evelyn Riggan, Visually Impaired Program Parent Consultant, Portland Public Schools, Portland, Oregon

Dr. Lee Robinson, Executive Director, National Association for Parents of Visually Impaired Children, Dallas, Texas

Ms. Darla Saunders, Coordinator of Parent-Infant Program, Utah School for the Blind, Ogden, Utah

Ms. Eileen Scott, Children's Program Director (Retired), Canadian National Institute for the Blind, Vancouver, Canada

Mrs. Suzanne Swaffield, Supervisor, South Carolina Commission for the Blind, Columbia, South Carolina

Stuart Teplin, MD, Pediatrician, University of North Carolina School of Medicine, Chapel Hill, North Carolina

Mr. Chris Tompkins, Executive Director, Dallas Services for Visually Impaired Children, Dallas, Texas

Ms. Suzanna Winkler, Preschool Director, West Germany

#### Educational Measures

Mrs. Sarah Ashman, Psychologist, Indiana School for the Blind, Indianapolis, Indiana

#### Educational Research and Development Committee

Miss Lynne Albright, Coordinator, New Hampshire Educational Services for the Visually Handicapped, Concord, New Hampshire

Dr. Richard M. DeMott, Superintendent, Iowa Braille and Sight Saving School, Vinton, Iowa

Dr. Lars Guldager, Superintendent, Oak Hill School, Hartford, Connecticut

Dr. Richard E. Hyer, Jr., Superintendent, Georgia Academy for the Blind, Macon, Georgia

Dr. L. Leon Reid, Director, The Greater Pittsburgh Guild for the Blind, Bridgeville, Pennsylvania

Mr. Fred L. Sinclair, Director, Clearinghouse Depository for Handicapped Students, Sacramento, California

Mrs. Julie Holton Todd, Coordinator, Ohio Resource Center for Low Incidence and Severely Handicapped, Columbus, Ohio

Identification of Research Needs in Low Vision

Dr. Natalie C. Barraga, Professor Emeritus, University of Texas, Austin, Texas

Mrs. Nan C. Dempsey, Supervisor, New Jersey Commission for the Blind and Visually Impaired, Camden, New Jersey

Dr. Randall T. Jose, Coordinator of Low Vision Clinic and Associate Professor, University of Houston College of Optometry, Houston, Texas

Microcomputer Applications

Miss Lynne Albright, Coordinator, New Hampshire Educational Services for the Visually Handicapped, Concord, New Hampshire

Dr. Alan Brightman, Director of Special Education, Apple Computer, Inc., Cupertino, California

Dr. Tim Cranmer, Director, Research and Development, National Federation of the Blind, Frankfort, Kentucky

Mrs. Barbra Creasy, Instructor, Kentucky School for the Blind, Louisville, Kentucky

Mr. Bill Davis, Media Specialist, New Mexico School for the Visually Handicapped, Alamogordo, New Mexico

Mr. Paul Edwards, Project Coordinator, Independent Living for Adult Blind, Florida Junior College at Jacksonville, Jacksonville, Florida

Dr. Emerson Foulke, Director, Perceptual Alternatives Laboratory, University of Louisville, Louisville, Kentucky

Miss Carla Franklin, Convention Coordinator, American Council of the Blind, Louisville, Kentucky

Mr. Fred Gissoni, Director, Technical Services, Kentucky Department for the Blind, Frankfort, Kentucky

Mr. David Hauck, Rehabilitation and Technology Specialist, Illinois School for the Visually Impaired, Jacksonville, Illinois

Dr. Frank Irzyk, Media Specialist, New York Insitutute for the Education of the Blind, Bronx, New York

Mr. Harvey Lauer, Technology Transfer Specialist, Veterans Administration Medical Center, Hines, Illinois

Mr. Joe Lazaro, President, Talking Computer Systems, Revere, Massachusetts

Mr. Bruce McClanahan, Orientation and Mobility Specialist, Area Education Agency 6, Marshalltown, Iowa

Dr. Sandra Ruconich, Learning Technology Specialist, Kentucky School for the Blind, Louisville, Kentucky

Dr. LaRhea Sanford, Lead Vision Teacher, Metropolitan Nashville Public School, Nashville, Tennessee

Mr. Bill Schenk, Instructor, Tennessee School for the Blind, Nashville, Tennessee

Mrs. Deanna Scoggins, Special Teacher, Kentucky School for the Blind, Louisville, Kentucky

Mr. Milo Street, President, Street Electronics Corporation, Carpinteria, California

Ms. Maxine Surrat, Head Librarian, Louisville Regional Branch of the National Library Service for the Blind and Physically Handicapped, Louisville, Kentucky

Mr. Wayne Thompson, Engineer, Kentucky Department for the Blind, Frankfort, Kentucky

Mr. Joe Williams, Senior Staff Writer, Apple Computer, Inc., Cupertino, California

Mrs. Bonita Wilson, Typing Instructor, Kentucky School for the Blind, Louisville, Kentucky

#### Prevocations1

Mrs. Gretchen Stone, Occupational Therapist/Rehabilitation Counselor, Texas School for the Blind, Austin, Texas

#### Read Again: A Program for Adventitiously (Recently) Blinded Persons

Mrs. Pam Cannon, Teacher, Atlanta Area Services for the Blind, Atlanta, Georgia

Ms. Margie Cernitz, Teacher, Montgomery County Schools, Bethesda, Maryland



Mrs. Marietta Howington, Teacher (Retired), Tennessee School for the Blind,  
Nashville, Tennessee

Miss Marjorie Miller, Assistant Director, Professional Services, Chicago  
Lighthouse for the Blind, Chicago, Illinois

Dr. Roseann Reid, Chairman, Education Department, The Greater Pittsburgh  
Guild for the Blind, Bridgeville, Pennsylvania

Sensory Development Materials for Adolescent Multihandicapped Visually  
Impaired Students

Ms. Mary Brady, Director, Pennsylvania Assistive Devices Center,  
Elizabethtown, Pennsylvania

Mr. Michael Collins, Supervisor of Deaf-Blind Department, Perkins School for  
the Blind, Watertown, Massachusetts

Ms. Marty Davis, Vocational Specialist, Oak Hill School, Hartford,  
Connecticut

Dr. Richard E. Hyer, Jr., Superintendent, Georgia Academy for the Blind,  
Macon, Georgia

Ms. Christine Kennedy, Supervisor of Multihandicapped Department, Western  
Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Ms. Ellen Kissinger, Teacher, Berks County Intermediate Unit, Reading,  
Pennsylvania

Mr. Larry Melander, Supervisor of Lower School, Perkins School for the  
Blind, Watertown, Massachusetts

Mr. Tom Miller, Supervisor of Infant-Preschool Program, Perkins School for  
the Blind, Watertown, Massachusetts

Mr. Fred Sinclair, Director, Clearinghouse Depository for Handicapped  
Students, Sacramento, California

Topical Seminars in Special Education

Mrs. Ruth Holmes, Low Vision Consultant, Illinois School for the Visually  
Impaired, Jacksonville, Illinois

Dr. Roseann Reid, Chairman, Education Department, The Greater Pittsburgh  
Guild for the Blind, Bridgeville, Pennsylvania

Research and Development Personnel for FY 1986

|                           |  |
|---------------------------|--|
| Bolin, Gene               | Secretary/Library Assistant            |
| Caton, Hilda, EdD         | Research Scientist (part time)         |
| Davis, Gary               | Mechanical Designer (part time)*       |
| Duckworth, Bill, MS       | Librarian/Research Scientist           |
| Glass, Robert, MEd        | Research Associate                     |
| Junot, Jim, BS            | Personal Reader-Assistant/Clerk-Typist |
| Moore, Sheri, MS          | Research Scientist                     |
| Morris, June, MA          | Director                               |
| Pester, Eleanor, MS       | Research Associate                     |
| Poppe, Tom                | Model and Pattern Maker*               |
| Skutchan, Larry, BA       | Systems Programmer                     |
| Willis, Deborah, MA       | Research Associate                     |
| Wright, Suzette Frere, BA | Research Associate                     |

\*Design and Development Section

Contracted Personnel

Bradley, Eddy Jo, MA  
Cambron, Patty, BA  
Hamlett, Carol, BA  
Hamp, Eric, PhD  
Otto, Fred, BA  
Sliwa, Steve, PhD  
Walsh, Jeannette, RN  
Webb, Jane, BA  
Woodworth, Jean, MA

Publications during FY 1986

- Franks, F. L., & Glass, R. D. (1985). Microslide cassette programs for low vision students. Education of the Visually Handicapped, 17, 11-16.
- Moore, S. B. (1986). Multihandicapped visually impaired infants: Critical issues. In Proceedings of the National Forum on Critical Issues in Infant and Preschool Education of Blind and Visually Impaired Children. New York, NY: American Foundation for the Blind.
- Willis, D. H. (1986). American Printing House Announces New Tech Products. Journal of Visual Impairment & Blindness, 80, 694.
- Willis, D. H. (1986). Commercial software talks. Senus, 11-13.

PROGRAM MATERIALS

- Duckworth, B., & Caton, H. (1986). Basic Reading Rate Scale braille edition: Directions for administering. Louisville, KY: American Printing House for the Blind.
- Duckworth, B., & Caton, H. (1986). Basic Reading Rate Scale large type edition: Directions for administering. Louisville, KY: American Printing House for the Blind.
- Frere, S. (1985). Light box activity guide: Level II. Louisville, KY: American Printing House for the Blind.



Presentations and Workshops during FY 1986

- Caton, H. R. (1985, June-July). Braille. National conference on the status of education and blind. 45th annual convention of the National Federation of the Blind, Louisville, KY.
- Caton, H. R. (1985, June-July). Patterns: The Primary Braille Reading Program. Parents of Blind Children Division. 45th annual convention of the National Federation of the Blind, Louisville, KY.
- Caton, H. R. (1985, July). Read Again. Seminar: Methods and materials for rehabilitation of visually handicapped. American Printing House for the Blind, Louisville, KY.
- Caton, H. R., & Pester, E. J. (1986, June). Seminar: Methods and materials for teaching braille reading. American Printing House for the Blind, Louisville, KY.
- Duckworth, B. J. (1986, June). Reading assessment for braille readers. Seminar: Methods and materials for teaching braille reading. American Printing House for the Blind, Louisville, KY.
- Glass, R. D. (1986, April). Microcomputer materials from the American Printing House for the Blind. 64th Annual Meeting of the Council for Exceptional Children, New Orleans, LA.
- Glass, R. D., & Skutchan, L. D. (1985, November). Training with APH microcomputer materials. Illinois School for the Visually Impaired, Jacksonville, IL.
- Moore, S. B. (1985, September). Educational materials and related learning techniques for the multihandicapped visually impaired student. South Carolina Commission for the Blind and the South Carolina Department of Mental Retardation, Clinton, SC.
- Moore, S. B. (1985, October). New materials from the American Printing House for the Blind for infant and preschool children. 11th International Symposium on Infant and Preschool Blind and Visually Impaired Children, Alamogordo, NM.
- Moore, S. B. (1985, August). Workshop on Printing House low vision materials for the young and multihandicapped learner. New Hampshire Educational Services for the Visually Handicapped, Concord, NH.
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**American  
Printing House  
For The Blind  
Incorporated**

DEPARTMENT OF EDUCATIONAL RESEARCH  
REPORT OF RESEARCH AND DEVELOPMENT ACTIVITIES  
FISCAL 1987

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

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Activities underway during FY 1987 clearly reflected the highest priorities recommended by the preceding year's Educational Research and Development Committee. The top priorities recommended by this advisory committee to the American Printing House for the Blind (APH) were: (a) to continue development of software and implementation of microcomputer related technology, (b) to continue development and production of materials for individuals with multiple handicapping conditions, and (c) to place greater emphasis on research and development of early childhood materials. At the same time, other Departmental activities responded to continuing needs for materials in the areas of low vision, braille, and educational measures.

Outside support for the research program was through monies for research and development in the federal appropriation to APH and through a 5-year grant from the Special Education Programs, Office of Special Education and Rehabilitative Services, US Department of Education, which is partially underwriting the development of a braille language program to parallel APH's popular Patterns braille reading program.

In addition to its primary responsibilities for research and development, the research staff played an active role in disseminating information. Such activities included participating in seminars and workshops; making presentation; contributing articles to newsletters such as the DVH Quarterly, APH Slate, and BAUD; and bearing responsibility for APH's Micro Materials Update newsletter. Research staff organized the "Special Materials Workshop for University Personnel Preparation Programs" held the day preceding the 1986 Annual Meeting for the purpose of providing information about APH's products and services to these key professionals to help them serve their students better. Additionally, research staff organized and participated in APH's 1987 summer seminar program. Topics were chosen from those recommended for high priority attention; namely, "Introduction to Computer Applications and Technology for Visually Impaired Persons" and "Methods and Materials: Early Childhood/Visually Impaired." These seminars were cosponsored by the University of Louisville so college credit could be earned. Other dissemination activities included representing APH at professional meetings and staffing APH's exhibits. In professionally related matters, several members of APH's research and other professional staff played an active role in the development of a Kentucky Chapter of the Association for Education and Rehabilitation of the Blind and Visually Impaired and the organization of its first annual conference as well as serving in leadership roles with other organizations.

Research activities are supported through the Department's Research Library and Model Shop. The Library serves by receiving, processing, and maintaining materials relating (a) to the field of blindness and (b) to specific activities within the Department. Bill Duckworth is the Librarian. He is assisted by

Gene Bolin. The purposes of the Model Shop are (a) to support research and development activities through design of new products, development of prototypical models, and production of field evaluation materials, (b) to support production activities through the provision of technical drawings for new products and the development of some of the patterns and special tooling required for their production, and (c) to conceptualize and implement improvements to existing educational materials including their redesign for better use and/or more efficient production along with the provision of some of the patterns and special tooling required for their production. Tom Poppe is responsible for these activities.

During FY 1987 the Department of Educational Research was fortunate in acquiring several talented additions to its staff. These included Fred Otto and Karen Peters, Research Assistants; Jeff Wheatley, a programmer; and Josephine Stratton, a Research Intern from the doctoral program of Teacher's College, Columbia University. Cooperation with the Department's various activities, both from within APH and from others working in the field, remains laudable as does the support for its program from APH's Corporate Trustees and from APH's Educational Research and Development Committee.

This report has been prepared in a new format for improved clarity. An outline of the activities reported is provided by the Table of Contents. Then, following the introductory comments, summaries of research activities are presented with each starting on a new page. The summaries are formatted to show: if a new or continuing project, purpose, project staff, background, work during FY 1987, and work planned for FY 1988. Back matter provides lists showing agencies participating in research, consultants, research and development personnel, publications, presentations and workshops, and new products.



**Early Childhood and Multihandicapped**



Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children (continuing)

Purpose: To develop a set of materials, targeted for professionals and parents, to assist in developing critical skills in visually handicapped children, birth-24 months

Project staff: Sheri Moore, Project Director

Background. Two of the three components of this project have been completed and are available. These include a guidebook, Beginnings: A Practical Guide for Parents and Teachers of Visually Impaired Babies and a slide-cassette program, "Playing the Crucial Role in Your Child's Development." The slide-cassette program is also available in Spanish. Both products are designed for the professional or parent working with visually handicapped children, birth-24 months. Initial work on the project was funded through a grant from Special Education Programs of the US Department of Education.

Work during FY 1987. The third component of the Home-Based Media materials, a sound-producing sensory mat, is constructed to enhance the young blind or visually handicapped child's auditory and motor development. When activated by the child's movement, the mat produces motivating and pleasing tones, encouraging the development or refinement of a variety of gross motor skills. These skills include rolling over, sitting up, pulling to standing, crawling, walking, and so on.

Based on state of the art electronics, the mat has been redesigned to include a large membrane switch, which is made by silk-screening silver or copper traces onto plastic sheets. Remaining is the need for the electronics which control the mat functions to be redesigned to incorporate a microprocessor based circuit board with an accompanying custom designed software program. These modifications will enable the mat to produce songs as well as tones, reduce unit cost, provide a more dependable product, and allow for the addition of related functions to the mat in the future. However, cost is a major factor that is unresolved. A number of meetings have been held regarding this cost dilemma, but a decision regarding further work on the mat has not been made.

Work planned for FY 1988. Cooperative efforts will continue with in-house electronics and production personnel to reach a decision regarding the cost feasibility of continuing development of the Sensory Mat.



### Fine Motor Development Materials (continuing)

Purpose: To design a set of tangible materials useful in developing critical fine motor functions for visually handicapped and blind children, birth-48 months

Project staff: Sheri Moore, Project Director

Background. The Fine Motor Development Materials: Twist, Turn, and Learn are designed to assist young and multihandicapped visually impaired students (birth-36 month functional level) in developing, refining, and reinforcing small motor functions. Eight modular units are constructed to assist in developing fine motor skills such as reaching and grasping, raking or whole hand use, pincer grasp, wrist rotation, searching technique, palmar grasp, visual-motor, and visual-perceptual coordination.

Work during FY 1987. Research personnel worked cooperatively and actively with production personnel, particularly the Project Development Department, as the Fine Motor Materials moved through the production process. Cooperative efforts were made to design the modular units for production efficiency and low unit cost. For each of the eight modules, a brief description and a sampling of skills that can be developed or reinforced is listed.

**FUN FLOWERS:** A module mounted with multicolored flowers and with bells. Helps a child to develop grasp/release, reaching, raking, eye-hand coordination, finger manipulation/coordination, and tactual discrimination.

**CLOWN PULL:** A colorful clown face appears in this module. Pulling alternately on the clown's nose or bow tie causes a bell to sound. Helps the student in developing palmar grasp/release and eye-hand coordination.

**RATTLES:** Various shaped, multicolored rattles mounted inside this module on two rods. Reaching-grasping, pincer grasp, finger manipulation/coordination, and tactual discrimination are developed by this module.

**HAPPY AIRPLANE:** This module contains a picture of a cheerful airplane. When the plane's propeller is spun, a bell chimes. Develops the student's wrist rotation, palmar grasp, grasp/release, and reaching-grasping.

**BELL CHIME:** A module mounted with a circular disk. The disk is rotated by a handle, causing a bell to ring. Helps the student to develop pincer grasp, wrist rotation, and finger manipulation/coordination.

**SPINNER WITH OVERLAYS:** Four brightly colored geometric patterns come on two disks designed to be overlaid on this module's spinner. Pincer grasp, finger manipulation/coordination, visual discrimination, raking, and eye-hand coordination are developed.

**HOOK/LOOP PULL:** Two colorful strips of hook/loop material with handles for grasping are fastened to this module. This helps the child to develop grasp/release, pincer grasp, two-handed grasp, and two-handed pull.

HIDDEN POCKET: This module has an elastic cloth pocket for hiding various objects. Helps the student to develop search techniques, tactual discrimination, and reaching/grasping skills.

Modifications were also made to the activity guide, reflecting production changes in the eight modular units. Following completion of the activity guide, an expert and final review was conducted on its contents. In addition, the activity manual was edited and readied for publication. The cover of the manual was designed by a visually handicapped student.

Work planned for FY 1988. Work remains in preparing a final project report. The development of the project from the needs assessment process through its production will be chronicled.

Early Childhood Educational Materials (new)

Purpose: To determine the feasibility of developing specific, needed early childhood educational materials and, where feasible, to initiate planning for and/or product development

Project staff: Sheri Moore, Project Director

Background. A needs assessment meeting was conducted during the 1986 Council for Exceptional Children conference to develop recommendations for specific early childhood educational materials research and development projects. The committee delineated and set priorities for five specific areas as follows:

1. Infant skills kit--a collection of tangible child-use materials effective in teaching the development of critical skills, especially those in which blind/low vision children traditionally show substantial delay.
2. Switch-activated materials--an assortment of tangible child-use switches designed to be activated by pressure. The purpose of the switch-activated materials is to teach causal relationships and to learn control over the environment.
3. Beginning picture books with visual and tactual interest--a series of books specifically designed to use with a low vision child or a tactual learner. Books should deal with the young child's environment and related experiences.
4. National Library Service (NLS) recorded tapes for young children--there is a need for age-appropriate tapes available from NLS for early childhood level learners. Presently, the tapes are too complex and involve advanced concepts and language.
5. "Peel and Feel"--adhesive backed sheets of varied colors and textures (examples: felt, plastic, sandpaper) used for labeling, tactual discrimination exercises, personal identification, and environmental coding.

Work during FY 1987. It was determined that the five areas identified for materials development projects are feasible and that such materials are not available from commercial sources. Product development planning was initiated with the objectives of the Infant Skill Kit being incorporated into a new project entitled "Visually Handicapped Infant/Toddler Curriculum and Training Project" and with development of prototypes for both a versatile and generic switch, allowing the activation of electrical devices, and tactile adhesive backed "Peel and Feel" type sheets.



Work planned for FY 1988. Materials development activities will be concentrated on the first priority of developing curricula and related training materials to assist in effectively teaching blind and visually handicapped infants. Refer to the "Visually Handicapped Infant/Toddler Curriculum and Training Project" section for specific information. Evaluations of the switch and the tactile sheets will be made and the products revised as needed.

Visually Handicapped Infant/Toddler Curriculum and Training Project (new)

Purpose: To develop a curriculum specific to blind and visually handicapped children birth through 2 years and to conduct a series of regional in-service training programs, paralleling the curriculum content, throughout the nation

Project staff: Sheri Moore, Project Director  
Suzette Wright, Project Assistant

Background. The 1986 early childhood materials needs assessment meeting prioritized infants, including the multiply handicapped blind/visually impaired infant, most in need of additional Printing House research and development efforts. The primary reason for this infant emphasis was the group's assessment of the critical nature of early intervention and the need for specifically developed educational and curricular materials to assist in preventing significant developmental delays.

Work during FY 1987. Given this rationale and the documented need, the Printing House developed a project plan with two major objectives: to develop a curriculum specific to blind and visually handicapped infants, toddlers, and their families (birth through 2 years) and to conduct a companion series of in-service training programs for professionals and parents. A number of specific content areas were selected as being among the most crucial for professionals and parents working with blind and visually handicapped infants and toddlers. Content areas selected for inclusion as both in-service training topics and curriculum components include: Assessment and programming of critical skills, medical concerns, the impact of visual loss on development, multihandicapped visually impaired infants, early orientation and mobility training, methods and materials, working with families, neurodevelopmental techniques, visual training and assessment, and implications for development of language and social skills. Both the in-service training and curriculum components of the project will emphasize a family systems involvement approach and a multiagency, multidisciplinary service delivery model.

The project plan follows this basic strategy: identify and confirm, via consumers, the topical areas most critical for parents and vision professionals desiring in-service training to work with infants and toddlers. Then, identify and recruit professionals and parents from a variety of disciplines who are expert in a given topical area. Have the expert professional write a curriculum section or chapter on the designated topic. Send this draft for peer review by consumers, followed by necessary revisions. Translate the written curriculum chapters into in-service training courses, to be offered on a regional basis throughout the country. These strategies meet the two project goals of developing a curriculum model and providing in-service training courses for professionals and parents working with blind, visually impaired, and multihandicapped infants, toddlers, and their families.

Work planned for FY 1988. The scope of this project will depend on available funds. Activities planned for the year include acquiring information from existing literature, curricula, and professional training programs relative to work with both nonhandicapped and handicapped infants and toddlers; identifying parent training needs and possible approaches for accomplishing such training; determining curriculum priorities; identifying project consultants; and identifying longstanding programs serving infants and toddlers in order to study their service delivery systems.



Developing Literacy: Basic Skills, Concepts, and Early Experience (new)

Purpose: To provide educators and parents of infants and young children with material which will assist them in providing the experiences and interaction needed to develop and interrelate skills and concepts which lead to literacy (the ability to bring meaning to and get meaning from symbols)

Project staff: Suzette Wright, Project Director  
Josephine Stratton, Project Author

Background. This project addresses concept development as an outgrowth of the development of other skills which enable the young child to gain information from and to understand the environment. A review of the literature confirmed the difficulty of isolating concept development from the growth of these basic skills. Building of adequate concepts is dependent upon sufficient environmental experiences and upon the development of "information-getting" skills, such as tactual and exploratory hand skills for the blind child, and certain motor, listening, and language skills. Not surprisingly, these same skills are considered fundamental to literacy. They are responsible for forming the child's "concept base" and for introducing an awareness of the function of symbols--both important components of literacy. These information-getting skills, together with the concepts they have helped to form and an awareness of the function of symbols, are the building blocks of literacy. Development of literacy begins at birth, as basic motor, language, listening, tactual, and exploratory skills begin to develop and as concepts take form. Interaction of the different skills and concepts is key to their continuing development. Learnings in one area reinforce and stimulate those taking place in another. The visually handicapped child, in particular, may need mediation to interactively use relative proficiencies in some areas, such as language and listening skills, to improve exploratory hand skills or build concepts. The blind child may need added environmental experiences to broaden his or her concept base and to ensure that skills and concepts are well-generalized. Although separate programs to teach some of these skills are available, skills are often taught through discrete activities which are not linked to one another or to skills developing in other areas. To date, the components of literacy have not been organized into a developmentally sound continuum and program which can be readily understood by educators and parents responsible for the development of visually handicapped children, starting from birth.

Work completed during FY 1987. In late FY 1987, preparation of the original project proposal, Planned Approach to Concept Education, was begun. In reviewing literature for the document, however, it became apparent that a reworking of the project's goals and content was needed. Subsequent research by APH intern, Josephine Stratton, and the APH staff member responsible for the proposal resulted in the revised project briefly described in this report. A revised proposal document has been written reflecting information contained in over 50 sources concerning the development of early skills, concepts, and experiences which are the components of literacy.

Work planned for FY 1988. Project planning will be completed. Further review of the literature, examination of existing programs for the targeted age group, analysis of developmental scales and measures appropriate for the infant/preschool population, and a meeting of project consultants are among the first project objectives which must be addressed.

Multihandicapped Adolescent Project (formerly entitled Sensory Development Materials for Adolescent Multihandicapped Visually Impaired Students)  
(continuing)

Purpose: To develop and evaluate both tangible materials and written community based learning activities designed to meet identified programmatic needs of adolescent multihandicapped students

Project staff: Sheri Moore, Project Director  
Suzette Wright, Project Assistant

Background. The Multihandicapped Adolescent Project is targeted for students who have achieved basic skill levels and are involved in an educational program emphasizing self-care, independence, and life/community living skills.

Work during FY 1987. Work continued on developing specific prototypical materials, following a delay caused by a personnel change in the Design and Development section. The tangible materials component has evolved into a secondary, supportive role as a strong orientation to the use of environmental materials and community experiences has been incorporated into the project objectives.

Along with the development of the tangible materials, specifications were written for the activities/guidelines component of the project. The literature review, undertaken at the initial stages of the project, was helpful in identifying content areas for the activity guide. Specifically, journal articles, media, curriculums and books pertaining to sensory training, age-appropriate materials, the multihandicapped adolescent, daily living skills, community living skills, self-help skills, life skills, survival skills, group home living skills, and transition were reviewed. From this review and the input of practitioners working with multihandicapped adolescents, target content areas were selected for inclusion in the activity guide. Examples of content areas include: grocery shopping, preparing simple meals, using public transportation, mobility to neighborhood businesses, use/value of money, clothing selection, communication skills in the community, getting assistance in the community, ordering in a restaurant, laundering and caring for clothes, use of leisure time, and identifying universal symbols (exits, fire, etc.).

As the activities are drafted, attention is given to experience based and community based learning. The activities are written at a basic level and could be used by staff inexperienced in working with the targeted group. An additional emphasis is on the use and development of the sensory processes in the acquisition of skills in the content areas presented. Regardless of category, all activities include environmental applications stressing the importance of developing independence, self-sufficiency, and community living/life skills.



Work planned for FY 1988. Following completion of the tangible materials and the written activities components, all prototypical materials will be duplicated for field evaluation. Field evaluation sites with suitable numbers of the targeted students will be identified and contacted regarding participation in field evaluation. Appropriate arrangements, including and obtaining student clearances for participation, will be made. Evaluation and data recording forms will be constructed as the evaluation plan is determined. An effort will be made to gather both student and teacher evaluative data. Field evaluation is scheduled for 8-10 sites, selected to reflect both a program type and geographic distribution.

Task Oriented Inventory and Work Skills Project (previously entitled  
Prevocational Skills Development Materials II) (continuing)

Purpose: To provide a program that will assess and include work skills activities for a process approach toward task oriented behavior with objects

Project Staff: Bill Duckworth, Project Director  
Suzette Wright, Project Assistant

Background. The Austin Work Skills Evaluation, from the Texas School for the Blind, was identified by project consultants as a program needing refinement but offering a great deal of excellent material for programming with young visually handicapped students with developmental delays as well as for moderately to severely multihandicapped student. The revision needed appeared a simple matter as the program was originally written. However, in working with the author, Gretchen Stone, it was found that she had many ideas for expansion of the program to include information for various populations of visually handicapped students. The program developed in scope to be more nearly a process of concept development for the limited student, or the student with limited experiences, than a program leading directly to vocational training. With the wide range of students needing training of this type, various professionals were critical of some aspects of the evolving program. This criticism was beneficial as it gave project staff and the author insight with which to revise the material. The program remains, however, a process of handling materials in a way leading to task-oriented behavior and the development of work-related concepts which will serve as a basis for more specific training.

Work during FY 1987. Major redesign of the format of the materials plus inclusion of refinements and explanations of many of the concepts were made to the program.

Work planned for FY 1988. To further refine the presentation so that an individual without experience with the program can use it and readily understanding its terminology and scoring system. In addition the program will undergo an expert review and field evaluation.

**Low Vision**





Bright Sights: Learning to See (continuing)

Purpose: To develop a kit of materials, divided into two levels of difficulty (sensory and perceptual), useful in assisting visually handicapped students functioning at a birth-36 month level to learn to use remaining vision

Project staff: Sheri Moore, Project Director  
Suzette Wright, Project Assistant

Background. The Bright Sights: Learning to See materials utilize special fluorescent objects to stimulate and train the residual vision of multihandicapped and young visually impaired students. These materials can be used with or without the illumination of a black light.

Work during FY 1987. Research staff has undertaken an update of the effects of exposure to ultraviolet black light in an ongoing effort to safeguard consumers. Three primary researchers of ultraviolet light (UV) exposure contacted during reinvestigation of black light safety expressed doubt that application of long wave UV light, as it might be used with these materials, would result in eye damage for nonalbino, phakic children who had not been administered photosensitizing drugs. However, no studies equivalent to use of black light with this product have been performed which would provide the basis for a final conclusion and absolutely guarantee its safety. In view of the lack of certain information regarding the safety of using black light for vision stimulation and training purposes, APH will be providing UV-protective eyewear to all who have purchased its Black Light and recommending consumers use it with all students. Significant efforts were made to acquire and evaluate an array of UV light blocking filters and lenses. A report, entitled "A Response to 'Ultraviolet Light: Some Considerations for Vision Stimulation'" was written by Suzette Wright.

Work planned for FY 1988. Project staff will continue to keep abreast of the literature regarding ultraviolet light exposure. A final report of the project will be completed.

Lights On: Learning to See (previously entitled Developing Vision through Lights) (continuing)

Purpose: To develop a set of light related materials that are useful in developing remaining vision in visually handicapped students functioning on a birth-36 month level

Project staff: Sheri Moore, Project Director  
Suzette Wright, Project Assistant

Background. The Lights On: Learning to See items are designed to promote the development of an array of basic visual skills including light awareness, attention to light, localization of light, scanning, tracking light, eye-hand/body coordination, and color discrimination.

Work during FY 1987. Project staff worked closely with production staff and personnel, particularly the Project Development Department. Research staff has cooperated with project personnel in sourcing components, designing packaging, and generally ensuring a viable end product. In addition, an expert review of all Lights On: Learning to See Activity Guide suggestions, guidelines, and activities was conducted along with a final editing prior to publication. Throughout this process, research staff worked closely with the Editorial Department.

Work planned for FY 1988. A final report, summarizing all phases of the research and development process related to the Lights On: Learning to See materials, will be written.



Identification of Research Needs in Low Vision (continuing)

Purpose: To review and evaluate the existing research on low vision and to identify current research needs in low vision

Project staff: Eleanor Pester, Project Director

Background. An annotated bibliography of nonmedical research on low vision was compiled and submitted to experts in the area of low vision to review and use as a basis for writing "think pieces" on research needs in low vision.

Work during FY 1987. Four "think pieces" were completed and analyzed yielding 97 suggestions for research. In spite of the diversity of suggestions, there was some agreement (two or more) on 16 of the suggestions. The number of suggestions for research was also compared with the number of abstracts reported for each area in the bibliography to discover trends that might be developing. Details of these analyses have been included in the final report.



**Braille**





Read Again: A Program for Adventitiously (Recently) Blinded Persons  
(continuing)

Purpose: To develop a set of materials designed to teach braille to persons who have lost their vision after initially learning to read print

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Fred Otto, Assistant Editor

Background. A complete set of materials was designed to teach braille reading to persons who have lost their vision after initially learning to read print. This set of materials was reviewed by the project's consulting committee. Pending revisions, the program was approved for production by APH's Publication Committee. Revisions of two of the beginning units introducing braille letters, numbers, and basic punctuation were made and the units were again reviewed by the committee. The committee's major suggestions this time involved incorporating the practice worksheets and reading applications throughout the units whenever possible rather than putting them at the ends of the units. Following this meeting, these units were once again revised to reflect these organizational changes. The tactual discrimination unit was also revised to conform to the language of revised units, completing work on the part of the program which deals with Grade 1 Braille.

Early in the project a survey of 200 adventitiously blind people learning braille was made to provide information for the development of the materials. An article describing the survey was written, submitted for publication, and rejected.

Work during FY 1987. The part of the program dealing with Grade 2 Braille was revised and new reading applications were selected.

Work planned for FY 1988. Additional practice materials available from APH will be referenced for each unit. Pending information from the research to be done on enlarged braille and spacing for adult beginning braille readers, the Read Again program will be turned over to production. The article on the survey of the adventitiously blind will be revised and submitted to another journal for publication. Additionally, an article on sequencing the presentation of the braille code for adults will be written and submitted for publication and a final report will be prepared.

Patterns: Prebraille Program (formerly entitled Braille Readiness Program)  
(continuing)

Purpose: To develop a comprehensive, sequentially organized braille readiness program

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Fred Otto, Assistant Editor  
Karen Peters, Assistant Editor

Background. Patterns: Prebraille Program is a learning readiness program which was designed for use with visually handicapped children before they begin the readiness level of a basic reading program. This program contains 80 lessons which help visually handicapped children develop their auditory, tactual, conceptual, and language abilities. It incorporates a number of readiness materials already available from APH and supersedes the Tactual Road to Reading program. This program was evaluated in use at field test sites in California, Kentucky, and Ohio during the 1985-86 school year. APH's Publication Committee has approved it for publication.

Work during FY 1987. Data collected during the field testing were used to make final revisions in the readiness program and the program was turned over to production.

Work planned for FY 1988. A final report will be written.

Braille Language Program (continuing)

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Eric Hamp, Linguist  
Josephine Stratton, Research Intern  
Karen Peters, Research Assistant

Background. This project is funded under a grant awarded to the APH by the federal Research in Education of the Handicapped Program's Field Initiated Research competition which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, US Department of Education.

Work began on the project in January 1984. Information on achievement in language, spelling, and word study skills was obtained through administration of a special braille edition of the Stanford Achievement Test, Intermediate 1, Form E by teachers to 57 blind 4th and 5th grade students to identify specific problems blind students have. Analyses were made of current spelling and English textbooks and of Patterns: The Primary Braille Reading Program. This information was used to develop the program. The program will consist of four levels, Levels A, B, C, and D. The first level of the program, Level A, was drafted, reviewed, revised, and sent to pilot test sites for evaluation. The consulting committee met and reviewed the Level A materials. Further revision were made based on these evaluations. Work was begun on Level B of the program.

Work during FY 1987. Level A materials were placed with 56 students and 30 teachers at 25 field test sites and visits were made to the sites at the beginning of the school year to explain the field evaluation procedure and at the end of the school year to administer a mastery test of the level. Level B materials were completed, reviewed, revised and sent to pilot test sites. The consulting committee met and reviewed the Level B materials. Further revisions were made based on these evaluations. Preliminary work on Level C has begun. Further analysis of the achievement test data has yielded information which will be useful for the development of Levels C and D.

Work planned for FY 1988. Data from the field evaluation will be analyzed and used to make final revisions to the Level A materials in preparation for production. Level B materials will be prepared and placed in the field for evaluation. Drafts of the Level C materials will be reviewed, revised as necessary, prepared, and sent to the pilot test sites for review. Work will begin on Level D.



Identification of Research Needs in Braille (continuing)

Purpose: To review and evaluate existing research on braille and to identify deficit areas in which additional research is needed

Project staff: Hilda Caton, Project Director

Background. The initial phase of this project was completed as a part of a project commissioned by the Braille Authority of North America. This phase included the reviewing and abstracting of studies related to the braille code only.

Subsequently, the project was expanded to include studies related to the learning and reading of braille. Other studies which have a direct relationship to the development of Grade 2 braille were also included. The following activities were completed:

1. Literature through 1986 was searched
2. Articles identified through the search were abstracted
3. Abstracts were organized chronologically so that specific trends and/or gaps in research could be identified
4. Reviews and evaluation of the studies were reported in ten-year segments with a summary statement at the end

Work during FY 1987. The report of the part of the project related to the braille code was completed. Results of the survey will be presented at the International Braille Conference in London, England, in September 1988.

Work during FY 1988. An analysis will be made of information from the literature related to the learning and reading of braille.

Braille Spacing and Size for Beginning Adult Readers (new)

Purpose: To determine the optimum spacing and size for initial presentation of braille to beginning adult readers

Project staff: Eleanor Pester, Project Director  
Hilda Caton, Assistant Director  
Karen Peters, Research Assistant and/or  
Fred Otto, Research Assistant

Background. Although little is known about the effects of spacing and size on the introduction of braille to adults, indications are that both play important roles in braille code recognition. Nolan and Kederis (1969) found that recognition of characters by 36 skilled braille readers in grades 4 through 12 was significantly influenced by the distance between dots and their location within the cell. Books for young beginning braille readers are generally double-spaced (interlined) in accordance with the standards for braille books. Milback (1954) and Hoffman and Cook (1970) suggest double-spacing both between lines and between words to aid young braille readers in discrimination. In a study done by Newman (1984) with 80 sighted male subjects, learning was facilitated by using large braille cells. Both braillewriters and slates and styluses are available for producing enlarged braille either with an enlarged dot or with a standard sized dot in an enlarged matrix. At least one braille program for adults, Braille Series, 1960, provides enlarged braille practice materials in three sizes--very much enlarged, moderately enlarged, and slightly enlarged braille. Some rehabilitation counselors feel they have better results when braille is presented initially to adults with more than the usual space around the braille characters, and some feel that enlarged braille is especially useful for teaching braille to people with decreased tactual perception. Others feel enlarged braille should not be used. Research is needed to determine optimum spacing and size for initial presentation of braille to beginning blind adult readers.

Work planned for FY 1988. A study will be designed and executed to compare the tactual performance of blind adults who do not know braille on a randomly ordered series of tasks which present braille characters in various spacing and sizes. Results will be used to formulate guidelines which will be used in the production of braille for beginning adult reading materials, such as Read Again.



**Educational Measures**





Brigance Diagnostic Comprehensive Inventory of Basic Skills (green)  
(continuing)

Purpose: To provide a tactile supplement to this Inventory making possible administration to blind students, prekindergarten through grade 9

Project staff: Bill Duckworth, Project Director

Background. Format and a labeling system indicating procedure were worked out to provide a tactile supplement for this inventory to accompany, and be used in conjunction with, the Print Edition. While it was difficult to obtain the publisher's permission to adapt these materials, APH now has permission and full cooperation in the adaptation process. APH's Publications Committee has approved this Inventory for publication.

Work during FY 1987. All test activities were edited as needed and assigned labels, the first 5 sections were submitted for publication. This represents volume 1 of approximately 5 volumes of the tactile supplement.

Work planned for FY 1988. All volumes of the supplement should be in production at the beginning of this period. While the braille and print coordination of the material will be complex, the supplement should be available in the fall of 1987.

Brigance Diagnostic Inventory of Early Development (yellow) (new)

Purpose: To provide a tactile supplement to this Inventory making possible administration to blind children, ages infancy through age 7

Project staff: Bill Duckworth, Project Director  
Jo Stratton, Research Intern

Background. This Inventory is being revised by its publisher and a new edition is expected out in 1988 or 1989. Most of the competencies will remain in the same order in the new edition and much of the material will remain intact. In order to benefit from Jo Stratton's expertise in early childhood, she worked on the development of the supplement. Work has progressed on the present edition only to the point that the material can be used when the new edition is published.

Work during FY 1987. All activities have been assigned a label as to what steps the teacher should take in administering the assessment; such as, using the supplement, using the Print Edition with modification, etc. Additionally, the format of all items that will appear in the tactile supplement has been determined. One section, General Knowledge and Comprehension, was completed, produced in proof form, and used to test the format.

Work planned for FY 1988. No further work is planned until the new edition is published.

New Educational Measures Identification (continuing)

Purpose: To identify educational measures widely used in the field that are appropriate for adaptation for use by visually handicapped persons

Project staff: Bill Duckworth, Project Director

Background. A survey was conducted through APH Slate readership, commercial test publishers, and psychologists working with visually handicapped persons to find which tests were widely used or needed that would be useful with the population.

Work during FY 1987. Several tests, suggested by customers, psychologists, and testing corporations, have been ordered and are presently being reviewed for adaptation possibility. Among these are the Detroit Tests of Learning Aptitude (large type), Woodcock Reading Mastery Tests (braille), Kaufman Assessment Battery for Children (braille), and the Iowa Tests of Basic Skills (braille and large type).

Work planned for FY 1988. A survey will be made of the 31 Materials Centers for the Visually Handicapped to find what requests are being made as to unavailable testing materials. Tests commonly named will be reviewed for adaptation possibility.

Each item in the 1990 Tryout Edition of the Stanford Achievement Test will be reviewed for adaptability into braille. As with the 1982 edition, Psychological Corporation will avoid including items, when possible, not feasible for braille in its next edition of the Stanford series.



Computer Administration of Academic Measures (new)

Purpose: To determine the feasibility of administering academic measures using computer technology

Project staff: Bill Duckworth, Project Director

Background. For ease of administering, scoring, and record keeping, it seems plausible to determine if some types of academic tests could be stored on computer disks so that the braille and large type user would be able to take these tests in this way. The braille user would use the voice synthesizer along with braille and tactile graphics where needed. Specifications for format and administration procedures for the large type user have yet to be determined.

Work during FY 1987. Test corporations were queried to determine tests presently being produced that are administered using a computer. It was found that most corporations were not producing tests on disk and of those that were, most of the tests were not academic but rather personality, occupational preference, and the like.

Work planned for FY 1988. To learn if it is feasible to administer an achievement test using computer technology, one level of the Stanford Series will be analyzed to identify problems likely to be encountered by students who normally use braille and large type editions. For example, questions requiring graphics and reading comprehension tests will require tactile material to accompany the disk. Experimental versions of several subtests from the Stanford Achievement Test will be developed, for both tactual and visual readers, and a pilot study conducted addressing the feasibility of using computers for administration of such tests.

**Microcomputer Applications**  
**Process and Information Dissemination**

#### Fourth Microcomputer Advisory Meeting (series)

Purpose: To identify and prioritize needs for educational materials to support use of microcomputers

Project staff: Debbie Willis, Project Director

Background. Because a new area of product design and development has begun at APH, an advisory group was formed in order to get more specific information and guidance on a continuing basis. Three microcomputer needs meetings were held with the advisory group at APH; the first was in August 1984; the second was in March 1985; the third was in October of the same year. As a result of these meetings, a list of greatest needs, moderate needs, and least needs was generated. Many of the greatest needs identified have been addressed by members of the Department of Educational Research at APH resulting in a new line of microcomputer related products for visually handicapped persons.

Work during FY 1987. The Fourth Microcomputer Advisory Meeting was held September 25-26, 1986. In addition to completing work underway, top priority needs determined at this meeting were:

- \*1. Complete work on the talking utilities disk (ProDOS and DOS 3.3) and include a program to install TEXTALKER automatically onto unprotected software.
- \*2. Develop an Apple Speaqualizer.
- \*3. Continue to adapt MECC software.
- \*4. Develop a Talking Apple Literacy Kit: Apple IIGS Edition.

At the Fourth Microcomputer Advisory Meeting, the participants requested that a block of time be set aside at the next meeting to discuss Early Childhood computer-related materials needed. In order to prepare for this, a questionnaire was developed by Sheri Moore, APH's expert in Early Childhood materials for visually handicapped children, and Debbie Willis. The questionnaire was sent to all Division 8 (Infant/Preschool Division) members of the Association for Education and Rehabilitation of the Blind and Visually Impaired. Approximately 300 questionnaires were sent. The questionnaire requested information regarding the use of microcomputers with young children.

Work planned for FY 1988. A fifth meeting of the Microcomputer Advisory Committee will be conducted in September of 1987 to review progress, discuss additional microcomputer-related products needed for use by visually handicapped individuals, and determine priorities.

Survey of Products Being Used and Products in Need of Development for Legally Blind Persons Using Microcomputers (continuing)

Purpose: To determine the greatest needs of the field and set priorities appropriately by gathering information on the current "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons

Project staff: Debbie Willis, Project Director  
Fred Otto, Project Assistant

Background. When APH became interested in developing microcomputer related products in the summer of 1983, it was necessary to determine the greatest needs of the field and set priorities appropriately. Information regarding the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons was gathered during the fall and winter of that year. Recognizing, however, that this is a rapidly changing field, a second survey was conducted in the winter and spring of 1986.

Work during FY 1987. The data from the 200 questionnaires were recorded and a portion analyzed for planning purposes and decision making.

Work planned for FY 1988. The data will be categorized and analyzed. A final report will be written.



Survey of Preferences and Needs in Speech Enhanced Microcomputer Materials  
(continuing)

Purpose: To survey preferences and needs in speech enhanced microcomputer materials and to develop programming recommendations for such materials

Project staff: Bob Glass, Project Director

Background. Rapid advancements in the technology of synthetic speech for microcomputers have spawned a variety of software products impacting visually handicapped users. Systems of preference among the blind, such as Street Electronics' TEXTALKER program, are often applied to programs with little or no consistency of use from programmer to programmer. For example, one program may permit the user to review the contents of a screen line-by-line through the use of certain control commands, while another fails to recognize those same commands relying, instead, upon the use of up- or down-arrow keys. Still other programs or systems contain no review features at all. Such an absence of uniformity in speech software has fostered the current condition where users frequently are forced to learn many synthetic speech conventions on a program-by-program basis in addition to a program's other rules for use.

In an effort to ameliorate this condition, participants at the Third APH Microcomputer Needs Meeting assigned a "critical need" priority to conducting a survey of preferences related to synthetic speech and to the establishment of industry-wide synthetic speech guidelines and/or preferences for use in development of microcomputer software. Additional objectives of the survey were to gather specifications for an APH edition of the TEXTALKER program; to identify potential Minnesota Educational Computing Consortium (MECC) titles for synthetic speech adaptation; to identify other speech-adaptable programs with high utility; to determine the need for and specifications of a talking calculator program; and, finally, to solicit further suggestions for needed microcomputer materials.

Work during FY 1987. Findings were grouped and compared between the three groups: blind users, teachers of the blind, and those individuals who are both blind users and teachers of the blind. Findings served as a basis for establishing preferences for the use of synthetic speech in microcomputer programs, for identifying MECC programs most highly recommended for speech adaptation, for developing final specifications for the APH edition of the TEXTALKER program, for documenting the degree of need and specifications recommended for a talking calculator program, and for identifying potential high priority needs for future microcomputer materials.

Work planned for FY 1988. Survey findings will be formally reported and articles will be prepared for publication and dissemination to appropriate concerns in special education technology. The need for a follow-up survey will be determined. The Microcomputer Advisory Group deferred discussion of the talking calculator program until its September 1987 meeting. Developments stated to MECC materials are described elsewhere in this report.

Observation of Students Using Computers (new)

Purpose: To observe regular public school students using microcomputers

Project staff: Debbie Willis, Project Director

Background. At APH's 1985 Interim Meeting, its Educational Research and Development Committee made a general recommendation that the members of the Department of Educational Research periodically visit public schools to observe how students are currently being taught and what they are being taught. Additionally, a recommendation made at the Fourth Microcomputer Advisory Meeting was that local sites be visited to observe use of IBM educational software.

Work during FY 1987. Price Elementary School in Louisville, Kentucky was visited for the purpose of simply observing students using microcomputers. The school has 25 Apple //e's set up in a computer lab. They use the Corvus hard disk system and present the students with four selections on the screen from which to choose:

1. MECC
2. Logo
3. Bank Street Writer
4. Public Domain

Three computer lab sessions of 1/2 hour each were observed. The first was a class of third graders; the second and third sessions were fourth graders. In the first session, there was only one parent volunteer who walked around and provided help when necessary. In the second and third sessions, the computer instructor, classroom teacher, and a parent helper were there to provide help. The students worked quite independently and stayed on task. It was interesting to see that most of the students wanted to challenge themselves and do the best they could.

Except for specified times when the students meet with the computer instructor to go over how to use a specific program or program language (i.e., Logo or Bank Street Writer), they are generally allowed to work independently. Sometimes the classroom teacher specifies whether certain students or all students are to work on certain subjects (e.g., math, science, language arts, etc.), or specific tasks (i.e., writing a letter to a friend).

There are enough computers in the lab that each person works individually with the computer. The majority of students in these three lab sessions were using MECC Math and Language Arts; a few were using Bank Street Writer; one was using Logo; one was using an updated version of Lemonade Stand.

Work planned for FY 1988. Schools will be visited from time to time to observe sighted and/or visually handicapped students in the classroom and students using computers.



Product Evaluation (continuing)

Purpose: To evaluate user satisfaction with APH microcomputer products, to monitor and improve project planning and management, to develop further guidelines for materials development of software which meets or exceeds evolving industry standards, and to continue the identification of users of APH microcomputer materials

Project staff: Bob Glass, Project Director  
Debbie Willis, Project Associate  
Larry Skutchan, Systems Programmer

Background. From the first software product published by APH, all microcomputer materials have included a self-addressed, postage-paid "User Survey Card" which asked for information which would identify the consumer, product, setting in which the product is used, strong and weak points of the product, suggestions for improvement, current equipment accessible to the user, number of users and their age/grade range, and additional comments. As an assessment instrument for evaluation, these cards provide a valuable source of information which will aid in the decision-making process of the staff involved with improving existing products, determining future needs and projects, and monitoring trends in the categories above.

Work during FY 1987. User survey cards were received at a rate which would indicate about a 4% return for overall sales. After the cards were received and preliminarily reviewed, a data base program was sought which would allow the greatest manipulation and analysis of the data, while remaining fully speech-accessible. The D-Base III+ program for IBM was purchased and a simple data design was implemented. When the AppleWorks 2.0 program became speech accessible, its use with the survey data also was investigated.

A number of special education software evaluation instruments were reviewed from the Council for Exceptional Children, Closing the Gap, Educational Products Information Exchange Institute, Association for Special Education, and a number of other concerns to determine how well APH software would fare in a third party evaluation. Implications for formalizing guidelines in evaluative development were noted. Among other findings, it was noted that teachers involved in special education technology are coming to expect program documentation for teacher use which reflects at least as much effort in its development as the software itself. Currently, APH software documentation is weak in this particular area.

Work planned for FY 1988. A refined data base design is being developed which will be implemented during FY 1988. Common components of third party software evaluation instruments will be identified and incorporated into procedural guidelines which should result in the development of educational software which scores high consistently on any third party test of educational quality. Furthermore, an evaluative instrument will be formalized for use by APH contracted reviewers which will aid in solidifying their perceptions and increasing the comprehensiveness of their reviews. It is anticipated that

this type of standardization of developmental procedures, combined with the results of the Survey of Preferences and Needs in Speech Enhanced Microcomputer Materials, will yield a significant approach to special education software development worthy of imitation and implementation by other publishers interested in making accessible educational software.



Information Dissemination: Micro Materials Update--newsletter (continuing)

**Purpose:** To provide a description of completed, ongoing, and planned APH microcomputer materials development projects to serve as a (a) newsletter for professionals in the field, (b) convenient means of responding to requests for more information, and (c) handout to distribute at appropriate presentations/workshops/exhibits

**Project staff:** Bob Glass, Project Editor  
Debbie Willis, Contributing Writer  
Larry Skutchan, Contributing Writer

**Background.** The first Micro Material Update was generated specifically for the purpose of serving as a handout for a teacher in-service presentation made by APH staff in November 1985. Initially 40 copies were produced for that workshop and 20 were brought back to Louisville. The leftover copies provided such a convenient method of responding to requests for more information that more copies had to be produced. Three months later, a second issue of 250 copies was needed. In its fifth issue, 3,000 copies were necessary to keep pace with requests for more information.

**Work during FY 1987.** As a word-processed document, the Update required little effort to revise each quarter. In its fifth issue, Winter 1987, the writing style was lightened to be less technical and intimidating for novice computer users and the format was expanded to include a forum for the field, "News, Views, and Muse from the Field."

**Responsibility for the Update** was divided between research and marketing staffs to minimize research's overall involvement of time. Currently, research is responsible only for the content of the newsletter and for providing an address label printout of consumers known to have an ongoing involvement in special education technology. Additionally, the entire Winter 1987 newsletter was placed on SpecialNet and CompuServe.

The mailing list has been growing almost exponentially from quarter to quarter, providing research and marketing staffs with a valuable access to the individual users, teachers, rehabilitation counselors and instructors, and parents which are actually buying and using APH software and related products.

**Work planned for FY 1988.** Research staff involved in special education technology are frequently approached by individuals in the field to aid in the centralization or dissemination of information resources related to microcomputer applications with the visually handicapped. Typically these individuals feel that hardly any other organization has the resources to accomplish this service on an ongoing basis. Current plans call for maintaining that part of the newsletter specifically related to APH's microcomputer products, and expanding this vehicle to include an open forum for professionals in the field who wish to comment on APH's microcomputer products. At this time, the newsletter will continue to be updated and disseminated on a quarterly basis free of charge. However, cost and worth will have to be determined in considering the future of the publication.

Information Dissemination: Introduction to Computer Applications and Technology for Visually Impaired Persons--summer seminars (new)

Purpose: To introduce instructors of visually handicapped students or clients to current applications and uses of technology

Project staff: Debbie Willis, Seminar Organizer and Assistant Instructor  
Larry Skutchan, Assistant Instructor  
Bob Glass, Assistant Instructor  
Jeff Wheatley, Assistant Instructor

Work during FY 1987. Members of the Fourth Microcomputer Advisory Meeting assigned high priority to having workshops and/or videotapes offered on how to use APH microcomputer products. It was decided that two identical weeklong seminars would be offered in June 1987. They were taught by Sandra Ruconich, Computer Specialist, Kentucky School for the Blind. The seminars primarily focused on Apple microcomputers and how to use selected software, hardware, and peripherals with them. Speech, large print, and braille forms of access technology were used. Participants had the opportunity to see and work with technology products made by APH and other vendors who manufacture computer-related products for visually handicapped persons. Combination lecture/lab approach was used throughout. Extensive "hands-on" experience was provided. Each participant had access to an Apple microcomputer. Participants received several valuable resource lists. Optional sessions that introduced the IBM-PC computer, Speaqualizer, and VISTA were also conducted.

The final evaluations by the participants of the two weeklong workshops made it quite clear that the courses had met a significant need in the field. The participants expressed their great hopes that, whether next summer or 2 years from now, additional courses on using computers with visually handicapped individuals could be offered. The instructors as well as students benefited from the courses. APH instructors had the opportunity to observe a number of people using APH-developed software and thus to learn which features worked particularly well and which might need some additional refinement.

In addition to these planned weeklong seminars, several workshops, presentations, and demonstrations have been provided at a variety of conferences, meetings, and schools, and to groups or individuals visiting APH.

Work planned for FY 1988. Depending upon the need and requests received from the field, one or more similar workshops, or briefer workshops focusing on learning to use specific equipment or software, may be offered during the summer of 1988. Workshops, presentations, and demonstrations will continue to be given at appropriate conferences. A limited number can also be arranged at schools or agencies if staff expenses can be paid by the sponsoring organization.



**Microcomputer Applications**  
**Products**





Calculator Program (continuing)

Purpose: To determine the need for and specifications of a talking calculator program and to implement a corresponding software development plan which will require a minimum of staff involvement

Project staff: Larry Skutchan, Systems Programmer  
Bob Glass, Project Associate  
Debbie Willis, Project Associate

Background. The members of the Third Microcomputer Advisory Meeting conditionally recommended the development of a talking calculator program, if the programming tasks were subcontracted. The intent of this conditional recommendation was to involve APH staff as little as possible in time-consuming programming tasks in order to free the time for equally or more pressing concerns which could not as easily be subcontracted. The staff identified and made preliminary contact with S-C Software of Dallas regarding the programming duties.

A survey was begun to determine the need for and specifications of a talking calculator program. Results indicated that the greatest needs for calculating software were primarily in the areas of business and scientific calculations. A major specification of the program, regardless of its functions, was low cost.

Pending results of this survey, APH's Educational Research and Development Committee conditionally approved a calculator program for production. Subsequently, at the Fourth Microcomputer Advisory Meeting, it was suggested that work on this project be deferred.

Work during FY 1987. Additional specifications were determined by Advisory Committee review and presented to S-C Software for a quote on programming costs. At a later date, an Apple calculator program developed by a Princeton mathematician, Glen Breeden, was discovered on CompuServe and found to be easily adapted for speech output. Permission from the author to adapt the program was sought and secured. Furthermore, the author agreed to donate the program to APH free of charge.

Work planned during FY 1988. As time permits, the program's transparency and flexibility will be investigated and improved to serve a broad range of users, and program documentation will be written.

Echo Commander (continuing)

Purpose: To provide a flexible speech synthesis control system for the Apple which includes the ability to control the speed of the synthesizer through a greater range than normally provided through software control

Project staff: Larry Skutchan, Project Facilitator

Background. The Echo Commander project began as a simple modification to a staff member's synthesizer. Every teacher and user that saw the system in use marveled at its flexibility.

The research staff obtained approval for the product from the Educational Research and Development Committee in May 1986 and negotiations with Street Electronics for modified circuit boards began.

Recognizing that thousands of users already own an Echo synthesizer, APH decided to offer the new system in two configurations; the complete system includes the circuit card, external speaker box, and TEXTALKER software. It includes everything needed to begin using speech on the Apple II. (The Echo Commander will not work on an Apple //c.) The control unit consists of the control box which is wired to the user's existing synthesizer.

Work completed during FY 1987. After completing the instruction and installation manual, the Echo Commander was turned over to production in July and is currently available. Interestingly, the first run of the Echo Commander: Complete sold out before the first unit was built. A second run of Echo Commander: Complete was modified to use the new Echo IIb circuit board and is currently available.

Work planned for FY 1988. The Echo Commander project is complete and no future work is anticipated.



Macintosh Experimentation/Enhanced Relations with Apple Computer, Inc. (new)

**Purpose:** to experiment with the Apple Macintosh computer for educational and desk-top publishing uses, and to help establish a local special education technology center

**Project staff:** Bob Glass, Project Associate  
Debbie Willis, Project Associate  
Larry Skutchan, Project Associate

**Background.** For the past 2 years APH has been a Registered Developer for Apple Computer. The relationship has steadily grown and improved in its degree of communication and cooperation.

**Work during FY 1987.** After the first visit by Apple Special Education Department staff to APH in January 1987, three important developments occurred: (a) APH became a charter member of the National Special Education Alliance (NSFA) announced at the Council for Exceptional Children convention in April 1987, (b) APH research personnel co-staffed Apple Computer's exhibit at the Council for Exceptional Children's 1987 convention, and (c) two Macintosh 512K computers were donated to the APH Department of Educational Research in hopes that new applications could be developed permitting greater accessibility to them by visually handicapped persons. Lines of communication between APH and Apple dealers of special education technology were established. Additionally, APH staff, the Jefferson County Council for Retarded Citizens, the Louisville Free Public Library, and a group of parents of handicapped children established 1 of 11 nationwide parent-owned special education technology centers in Louisville. Each of these 11 centers received a full complement of microcomputers, peripherals, special education software, and adaptive devices which allow any handicapped individual or parent to experiment with finding a specific microcomputer system configuration that best meet an individual's needs. A first call for assistance in identifying potential Macintosh adaptations was made through the APH Slate.

**Work planned for FY 1988.** As a local and national corporate citizen, APH will continually evaluate and take advantage of opportunities to assist in the growth of special education technology and improved microcomputer access for visually handicapped persons. To this end, APH plans to remain an active charter member of the nonpartisan National Special Education Alliance initiated by Apple. The parent-owned special education technology resource center, formed with APH assistance, will be available and accessible to all exceptionalities in a multistate area. This center will provide new access to materials resources and subjects which will enhance APH's role in delivering microcomputer materials accessible to visually impaired multihandicapped persons.

Although the Macintosh computers are a valuable addition to any organization concerned with research, publishing, and project management, a substantial commitment of staff involvement in Macintosh materials adaptation and development is difficult to justify over a long period. Progress and



potential in this area will be evaluated at the end of 1987 to determine the basis for future commitment of time and resources into this particular area. Material needs for the Apple II series and IBM and IBM compatibles will continue to be a higher priority consideration during FY 1988.

## Manuals (continuing)

**Purpose:** To provide manuals in braille, large type, recorded, or disk form to support use of commonly used microcomputer equipment and programs

**Project staff:** Debbie Willis, Project Co-director  
Bob Glass, Project Co-director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

**Background.** At the Third Microcomputer Advisory Meeting, it was recommended that APH make recorded versions of an IBM manual and an Apple manual on their respective disk operating systems. The specific IBM manual recommended was Running MS-DOS. The Apple II ProDOS User's Manual was selected as the most appropriate Apple manual to record. Permissions were received to record these manuals and make them available on cassette for use by visually handicapped persons. Publication approval was sought and granted by APH's Publications Committee.

Preliminary discussions held with representatives of Apple Computer in April 1986 resulted in an offer from Apple to supply the ASCII text files of any of their manuals for editing and dissemination by APH. After certain legalities with Apple were completed, the first text file, The Apple //e Owner's Manual was received in November for review. The significance of this gesture resides in the fact that an individual possessing the ASCII text file of any work has the ability to output that information in print, hard braille, refreshable braille, synthetic speech, and/or large type.

**Work during FY 1987.** Preliminary guidelines for recording computer manuals were drafted and Running MS-DOS and Apple II ProDOS User's Manual were recorded, proofed, and corrected. Research staff worked closely with production personnel throughout this effort. The two manuals became available in January 1987.

The ASCII text of The Apple //e Owner's Manual was analyzed. Graphic information is absent and editing for the purposes of describing illustrated information was begun. Additionally, a "manual-reading" program was conceptualized which will enable quick access of selected topics. Implications for future technical and nontechnical literature in ASCII text form were examined.

**Work planned for 1988.** Initial versions of two Apple manuals, for the Apple //e and the Apple II<sup>GS</sup>, and the reading program were reviewed with Apple Computer staff at the April 1987 convention of the Council for Exceptional Children. Results of this inspection will be reviewed and a procedure for more rapidly processing texts will be determined and, if warranted by sales, implemented. Additional uses of the manual reading program will be examined.

Sales of existing computer manuals in braille, large type, and recorded form will be the major criterion for decisions regarding future publications of computer related manuals.

MECC Software (continuing)

Purpose: To adapt widely used educational software distributed by the Minnesota Educational Computing Corporation (MECC)

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Jeff Wheatley, Programmer  
Bob Glass, Project Assistant  
Fred Otto, Project Assistant

Background. Participants in the Second, Third, and Fourth Microcomputer Advisory Meetings and members of the Educational Research and Development Committee at APH's 1986 Interim Meeting assigned high-priority status to the development of speech-adapted software from MECC. This challenge was particularly noteworthy because MECC materials were developed by educators and include a vast collection of titles already available to thousands of school systems nationwide. Additionally, many of the programs are designed for primary and elementary level students. Approval for production of speech accessible adaptations of the MECC software has been granted with the following priorities: 1. mathematics, 2. science and simple logic, and 3. English, social studies, and writing.

Work during FY 1987. The talking version of Elementary Volume 1--Mathematics, designed for grades 3 through 9, was completed, reviewed by in-house staff and outside consultants, and sent to MECC for final approval. After approval was received, the software entered APH's production pipeline. It became available in January 1987.

The math and science programs on the Elementary Volume 4--Math/Science/Astronomy disk were adapted for speech output. It was decided that the astronomy programs would require a great deal of time to adapt and would require the development of one or more tactile aids to accompany the highly graphic programs. The talking math and science programs on this disk will, therefore, be combined with other appropriate programs from another disk when such a disk is available.

It was also decided that while the content of Adventures with Fractions was quite good, the entire disk would have to be reprogrammed and one or more tactile aids or a supplement of tactile diagrams would have to be developed. Therefore, the adaptation of this program was postponed in favor of producing a less time-consuming MECC program.

Permission was sought and received from MECC to modify three additional selections. They are Elementary Volume 5--Language Arts (Prefixes), Food Facts, and Social Studies Volume 1. Each of these programs has been adapted for speech output, reviewed by in-house staff, and additional modifications made. Permission was sought and obtained from MECC to make a talking version of the worksheets available on the same disk of programs. A small, quick study was conducted at the Kentucky School for the Blind to determine whether visually handicapped students would be able to use a talking crossword puzzle on one of the worksheets accompanying the Elementary Volume 5 program.



Elementary Volume 5 and Food Facts have been evaluated by outside consultants. Some redesigning and reprogramming were done as a result of the consultants' evaluations. These two programs are ready for a final in-house review before being turned over to production. Social Studies Volume 1 has been redesigned and is being reprogrammed. It is ready to enter the evaluation phase.

Additional MECC software selections have been reviewed which address the area of writing. An appropriate writing program, Writing A Narrative, targeted for sighted students in grades 7 through 9, has been identified. Permission will be requested from MECC to modify this program for use by visually handicapped individuals.

Support was given to Bruce McClanahan in Area Education Agency 6 in Marshalltown, Iowa, who received a grant to modify several MECC selections. These speech-adapted programs, however, are currently only available to Iowa teachers. Research staff has reviewed the speech-adapted software selections and believes that with a very reasonable amount of redesign and reprogramming these programs would be valuable additions to the talking educational software available. Permission would be required from MECC before these programs could be made available through APH.

Lastly, in late June, MECC requested that an article be written for inclusion in their fall 1987 newsletter. The article was to provide an historical perspective of how the APH-MECC relationship was formed, the stipulations regarding speech-adapted versions of MECC programs, and what has been accomplished by working together so far. The article was written and submitted during the summer.

Work planned for FY 1988. Elementary Volume 5, Food Facts, and Social Studies Volume 1 will be produced and made available from APH. Permission will be sought to make a speech-adapted version of MECC's Writing A Narrative. Additional MECC programs will continue to be reviewed, appropriate programs selected, and permission sought to make adapted versions available to visually handicapped persons, provided their provision is justified by sales.



PocketBraille (continuing)

Purpose: To develop a portable note-taking device

Project staff: Larry Skutchan  
Bob Glass

Background. The Kentucky Department for the Blind developed the PocketBraille and PortaBraille. Each is a complete portable note-taking system with braille keyboard, parallel and serial ports, and a speech synthesizer. The PortaBraille additionally contains a braille display. Each contains firmware that make writing and editing possible. With the approval of the Educational Research and Development Committee, APH began designing a version of this system.

Work completed in FY 1987. Researchers worked with the Kentucky Department for the Blind to continue development of the devices' firmware. Additionally, the Fourth Microcomputer Advisory Meeting members approved developing a speech access device similar to the Speaqualizer for the Apple. Wayne Thompson, an engineer at the Kentucky Department for the Blind, developed a circuit board that plugs into the Apple and uses the PocketBraille to gain access to text displayed on the screen. APH staff members have been working closely with the Kentucky Department for the Blind in developing and testing firmware for the PocketBraille. Finally, the PocketBraille's manual was reviewed and edited.

Work planned for FY 1988. Continuing efforts in the area of expanding and enhancing the PocketBraille's firmware will remain the focus of this project in fiscal 1988. These changes include the addition of a Grade II reverse translator, support for time functions, and a calculator. The editor will also be enhanced to include easier editing and more features like block moves and search and replace. Advance formatting capabilities and enhanced speech prompts are also planned.

SEI Software (continuing)

Purpose: To adapt educationally sound, commercially available software for use by visually handicapped persons

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Meeting, a modified version of Sliwa Enterprises, Inc. (SEI) educational software series was given high priority. The content of each SEI program is appropriate for use by high school and college students, as well as adults. APH was able to make an arrangement with SEI for a customized edition of 33 of these programs. The modified programs were reviewed, problems were identified and corrected. These programs have been approved for production.

Work during FY 1987. Instructions and a reference card for using APH/SEI talking software were prepared and reviewed by in-house staff. The instructions and reference card were sent to SEI for approval. Once approval is received, selections will periodically enter APH's production pipeline. The first four selections scheduled to be turned over are US Government, Word Analogy, Vocabulary Builder, and American History I. APH has also requested that SEI incorporate an updated version of TEXTALKER on these programs so that they are completely compatible with the Apple IIGS.

Work planned for FY 1988. The software programs will continue to be turned over for production until all 33 programs are available.

Sensible Speller: Talking APH Version (continuing)

Purpose: To produce a talking spell checker

Project staff: Larry Skutchan, Systems Programmer  
Debbie Willis, Project Assistant  
Bob Glass, Project Assistant

Background. Sensible Speller is a spell checking program. With several requests from the field, the program's publisher, Sensible Software, Inc., agreed to produce a talking version of the speller. When the staff ordered a copy, they were horrified to note what had been done. The program was completely unacceptable. Research staff modified the program so that it used more conventional speech access techniques and gained approval from the Educational Research and Development Committee to produce the modified version of the program, which is now available.

Work completed during FY 1987. Researchers consulted with the programming staff at Sensible Software, Inc., on the proper techniques for using speech with the Echo synthesizers. The new TEXTALKER was added to the disk. The manual supplied by Sensible Software was recorded and included in the package. In addition, an addendum explaining the specifics of using speech with the program was written and added to the manual.

The program was sent to reviewers and turned over for production in November 1986.

Work planned for FY 1988. The Sensible Speller project is complete. Future enhancements will be dictated by responses from the field.

Speaking Speller (continuing)

Purpose: To produce a user-friendly spelling program

Project staff: Larry Skutchan, Systems Programmer  
Debbie Willis, Project Associate

Background. Members of the Third Microcomputer Advisory Meeting recommended modifying the spelling program which came on the disk supplied with the Echo II speech synthesizer. The program was used as a spelling quiz; the teacher types a list of words, and the student is given the word and asked to spell it.

After a thorough evaluation and examination of the code, the research staff chose to rewrite the program rather than attempt correcting several problems in the existing version. The result is Speaking Speller. Speaking Speller contains all the features of its predecessor, and includes several new capabilities. The program is also much more user-friendly. It was approved for production and is available from APH.

Work completed in FY 1987. Speaking Speller was turned over to production. After the first run, it received the new TEXTALKER program to expand its compatible to include the new Apple II<sub>GS</sub>.

Work planned for FY 1988. This project is complete and future upgrades to the software will be dictated by responses from the field.



Speaqualizer

Purpose: To produce a speech synthesis system for IBMs

Project staff: Larry Skutchan

Background. The Speaqualizer is a hardware based access package for the IBM computer. It permits the blind user to use speech to examine text displayed on the screen.

Speaqualizer was developed by the research committee of the National Federation of the Blind. After obtaining production approval from the Educational Research and Development Committee, APH research staff members began working with the National Federation of the Blind to continue development of the device's firmware.

Work completed during FY 1987. The research staff developed a list of recommendations for subsequent improvements that will be implemented by a consulting programmer. In addition, the manual was written.

Work planned for FY 1988. When the recommended changes to the device's firmware are complete, the process of testing and evaluating ROM revision 1.6 will begin. A new version of the manual reflecting the changes is also necessary.

Sunburst's Meet the Computer--Beginning Topics and Meet the Computer--Intermediate BASIC (new)

Purpose: To evaluate this program for use by visually handicapped students or clients who need to learn BASIC programming

Project staff: Debbie Willis

Background. Members of the Fourth Microcomputer Advisory Meeting assigned a high priority status to reviewing Sunburst's BASIC programming series for possible adaptation for use by visually handicapped persons. These include Meet the Computer--Beginning Topics and Meet the Computer--Intermediate BASIC.

Work completed during FY 1987. Both levels of the series were reviewed. The purpose of the beginning level is to teach a person how to write programs for the Apple II microcomputer. The programming language used to write the programs is BASIC. The beginning level includes a teacher's manual and sets of folders with lessons and activities.

The intermediate level does not include a teacher's manual. The format of the program is similar to the beginning level in that there are folders containing lessons and activities. At the end of each folder, in the first three sections, is a "Test Your Programming Skills" section. The answers to these exercises are on a 5 1/4" disk included in the set of materials.

This level introduces the learner to writing programs such as adventure games, math games, and games using animated graphics. The intermediate level of the program builds upon the concepts learned in the beginning level. The intermediate level is designed to follow Meet the Computer--Beginning Topics or a similar introduction to BASIC programming. Before using the intermediate level folders, it is necessary for many BASIC statements and commands to be understood.

These are an excellent materials that are easy to use and understand. Lots of examples are provided. Important information to remember is pointed out. Each lesson builds on the previous one(s). The folders point out that if a particular concept is not understood, the learner should review that lesson before continuing. These materials would be good for itinerant teachers because only the necessary packet(s) of lessons/activities could be taken out of the kit and used with the student(s).

Work planned for FY 1988. If adapting this set of materials is given a high priority, the first step will be to contact Sunburst and see if permission can be obtained for APH to make an adapted version of Meet the Computer--Beginning Topics and/or Meet the Computer--Intermediate BASIC available to visually handicapped individuals.

Talking Apple Literacy Kit (TALK): Apple //c Edition (discontinued)

Purpose: To develop a set of basic familiarization materials for use with an Apple //c to be used by teachers introducing the microcomputer to blind students or clients

Project staff: Debbie Willis, Project Director

Background. As the Apple //c microcomputer increased its presence in the marketplace as an inexpensive and powerful alternative to the Apple //e, participants in the Third Microcomputer Advisory Meeting strongly recommended the development of a Talking Apple Literacy Kit for the //c. Conditional production approval, pending results of a market survey, was given by APH's Educational Research and Development Committee.

Work during FY 1987. Results of the survey on products being used and products in need of development showed that only 4.3% of the microcomputers being used by APH's consumers were Apple //c. Therefore, the advisory group at the Fourth Microcomputer Advisory Meeting recommended the discontinuation of this project and also recommended that APH not record the Apple //c Owner's Manual.

Work planned for FY 1988. After some discussion, it became evident that what should be done is to make a general introductory kit for the Apple II family of computers. (Survey results indicated 81.7% of computers being used belonged to the Apple II family.) See next section of report.



Talking Apple Literacy Kit (TALK): IIe Edition (continuing)

**Purpose:** To provide an introductory set of speech-accessible computer software and related materials for the Apple IIe microcomputer which could be easily integrated into existing programs of computer literacy designed for both young and adult beginners

**Project staff.** Bob Glass, Project Co-director  
Debbie Willis, Project Co-director  
Larry Skutchan, Systems Programmer

**Background.** Following production approval, during the Fall and Winter of 1985, this product was in the production pipeline of APH. As the first entry by APH into the realm of software publication, the TALK materials also served as the stimulus for developing and coordinating various production resources into an ongoing system for the production of all future software titles. For example, as production of the TALK materials progressed, related efforts yielded a talking software logo, a standard 3-ring binder for all future documentation and software, a method of labelling disks in braille and print, methods for mass production of disks, construction of a specialized warehouse area for disk storage, fabrication of shipping containers, and a company policy on warranty, replacement, and unauthorized copying. Production and pricing of the Talking Apple Literacy Kit: Apple IIe Edition was completed in September 1986 and first run sales were most encouraging.

**Work during FY 1987.** Subsequent runs of the materials were initiated and sales remained brisk. A minor correction to the documentation was made before the second run began. A large number of requests from the field calling for the sale of the brailled keyboard model and Talking Apple Presents Apple software as individual items were received. A Marketing Committee decision was made to offer the brailled keyboard as a separate item sold in lots of five. No decision was made to offer the Talking Apple Presents Apple software.

**Work planned for FY 1988.** A substantial revision to the program, which will make it compatible with the entire Apple II series of computers, will be made. Additionally, the revised product will be brought into full compliance with certain Apple Computer legal guidelines related to the use of registered trademarks. Evaluation data obtained from user survey cards packaged with each program will be analyzed and appropriate suggestions incorporated into the new design.



Talking AppleWorks (continuing)

Purpose: To adapt AppleWorks for speech output

Project staff: Larry Skutchan, Systems Programmer  
Bob Glass, Project Assistant

Background. Participants of the Third Microcomputer Advisory Meeting recommended adapting AppleWorks, a popular integrated spreadsheet, database, and word processor program, for use by blind persons. This recommendation was made in recognition of the fact that it would be desirable, both from the teacher and student viewpoint, to permit blind students to use the same software as their sighted classmates. The committee also recognized that two of the modules, spreadsheets and databases, were not available to blind users.

Work completed during FY 1987. Since the time of the Third Microcomputer Advisory Meeting, a database which could meet the needs of many blind users has been released. However, the problem of accessing off-the-shelf programs still remains. To this end, the research staff has been working closely with the Kentucky Department for the Blind on hardware solutions to the problem.

Work planned for FY 1988. The AppleWorks project has been discontinued. Future efforts in the accessibility of this program will focus on the more universal solution of adding hardware to the computer system which overcomes many of the problems associated with software.

Talking Games Volume One (discontinued)

Purpose: To produce a disk of public domain games accessible through speech synthesis

Project staff: Larry Skutchan

Background. Members of the Third Microcomputer Advisory Meeting recommended compiling disks of superior quality, public domain games that functioned with speech and contained educational value. This product would permit teachers to introduce children to speech synthesis in a fun way.

Work completed during FY 1987. After gathering material for the project, it became apparent that few public domain games required less than several hours of modification to meet APH's standards. Further, tracking down the origin of each program to confirm its public domain status proved a time-consuming endeavor and not always verifiable.

Since work was already complete on this project when the decision to cancel was made, it was determined that the disk should be donated to a distributor of public domain disks. This was done, and the disk is available from the BAUD library.

Work planned for FY 1988. No further adaptation of public domain games is planned.

Talking Sargon II (discontinued)

Purpose: To produce a talking chess game

Project staff: Larry Skutchan

Background. Larry Skutchan modified an older version of SARGON, a computerized chess game, to function with speech. Attempts to contact the game's publisher to obtain permission resulted in no success.

Work completed in FY 1987. Continuing efforts to obtain permission to modify and market the SARGON game continued but were unsuccessful.

Work planned for FY 1988. The SARGON project has been terminated.

## Talking Typer (continuing)

Purpose: To provide students/clients and teachers with appropriate software and documentation for use in teaching/learning with computers

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Meeting, a typing program called Kids Can! Typer, developed by Ted Hasselbring and Carol Hamlett for sighted special education students, was demonstrated and discussed. The advisory group gave a speech-adapted version of this program a high priority and subsequently production approval was requested and granted for it. APH acquired complete marketing rights to the speech-adapted version and contracted with Carol Hamlett to make the necessary programming changes.

Work completed during FY 1987. A draft of the entire adapted program (teacher disk, student disk, and documentation) was completed. The three components were thoroughly reviewed by in-house staff. Several major "bugs" were found and corrected. A review of the entire program with suggestions for changes was sent to Carol Hamlett. While initial plans had not included adding speech to the teacher disk, Miss Hamlett reprogrammed that disk to make all the essential information being presented to the screen talk. A revised version was sent to APH. A preliminary review before being sent out for evaluation indicated there were still too many problems in the program's operation to send it out. Therefore, more revisions were required.

Work planned for FY 1988. When project staff is satisfied with the program, it will be evaluated by two members of the Microcomputer Advisory Committee, two typing instructors, and a teacher who has provided input throughout the project. Modifications will be made based upon their reviews. After the modifications have been made and the final version of the program has been approved by in-house staff, the Talking Typer program will be turned over for production. For a period of 1 year after the program is completed, Carol Hamlett will continue to make necessary revisions based on teacher, student, and client comments, suggestions, and criticisms.



Teacher's Pet (continuing)

Purpose: To produce a testing program

Project staff: Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant  
Debbie Willis, Project Assistant

Background. Larry Skutchan wrote a program several years ago that permits one to enter test questions so that the computer may be used to administer the test to a student. The program is called Teacher's Pet. He donated the rights to APH with the understanding that it was not perfect and that the documentation needed work. Production was approved by APH's Educational Research and Development Committee.

Work completed during FY 1987. Some enhancements were added to the program and the manual was rewritten. The program was field tested.

Work planned for FY 1988. The Teacher's Pet project will be completed. Future enhancements will be determined by responses and suggestions from the field.

TEXTALKER (continuing)

**Purpose:** To incorporate features specifically recommended by blind users into the TEXTALKER software and to set standards for use of speech synthesis on the Apple II

**Project staff:** Larry Skutchan, Systems Programmer

Background. TEXTALKER is the software that, in conjunction with an Echo synthesizer, provides the Apple II with speech output. It is the most used speech synthesis system for the blind because of features in the program that permit reviewing material already displayed on the screen.

Participants of the Third Microcomputer Advisory Meeting recommended that the program be modified to more accurately reflect the needs of the blind user and to help set standards for talking software. The research staff, in cooperation with Street Electronics Corporation, the synthesizer's manufacturer, installed several new features which were taken from a list of recommendations that came from a variety of sources including APH's speech survey and the suggestion files at Street Electronics. This product was approved for production and was released as version 3.1.1.

Work completed during FY 1987. Although little additional time was allocated to the TEXTALKER project for FY 1987, the introduction of the new Apple IIGS changed this prediction. Program modifications included installing features that make TEXTALKER compatible with the new Apple IIGS. The updates were reviewed and turned over to production in November 1986.

Work planned for FY 1988. The TEXTALKER project is complete. Program enhancements will be installed as feedback from the field becomes available. Future efforts to speech synthesis on the Apple will also continue to be investigated.

## Utilities Disk

Purpose: To produce a utilities disk

Project staff: Larry Skutchan

Background. Participants of the Third Microcomputer Advisory Meeting recommended that APH produce disks of most often needed utility programs that functioned with speech. This would allow the teacher and student to perform all the most needed disk maintenance operations with dependable talking software which would be available from one place.

The research staff obtained the source code to two of the utility programs from Apple Computer, Inc. and began modifying them.

Work completed during FY 1987. After careful consideration and suggestions from the field, the research staff determined that the most desirable approach to supplying utilities to both operating systems would be to produce a disk for each operating system--DOS 3.3 and ProDOS--that resembles, as much as possible, the original utilities disk supplied with the computer.

The two primary programs on the ProDOS utility disk were heavily modified to take advantage of speech and to eliminate problems associated with more crude modifications of these programs. The result is a ProDOS disk which, except for the addition of the speech software and a text file reading program, looks exactly like Apple's original and functions as if it were designed with speech in mind. The program is also packaged with a cassette version of the ProDOS User's Manual. The ProDOS version of this project, called Talking Utilities for ProDOS was turned over for production in March 1987.

The problems with the DOS 3.3 version of the utility disk were not so simple to solve. Programming, however, was undertaken.

Work planned for FY 1988. This project will be completed. Future work on this set of disks will be determined by user input.

**Other Activities**





Analysis of the 1987 Registration Data (new)

Purpose: To describe the legally blind population registered through APH

Project staff: Suzette Wright, Project Director

Background. Periodically, registration data are analyzed to document specific characteristics of legally blind students and clients registered under the Act to Promote the Education of the Blind. In order to clarify ambiguities in how these data were being reported, APH changed the format of the registration and, simultaneously, made some changes in the way information was to be reported. An attempt was made to make an analysis of the 1985 Registration Data--the first to be reported subsequent to the changes made. Unfortunately, it was necessary to discontinue this analysis due to the many irregularities found in how the data were reported.

Work during FY 1987. APH's Editorial Staff has made a major effort to clarify the instructions sent out for the 1987 registration so that all categories of information requested will be clearly defined and mutually exclusive. Additionally, programs were developed for a new computer system installed in APH's Editorial Department for managing the annual registration that will provide the data analyses required for implementing this study. Research staff has served in a consultative role as the definitions and programs were developed.

Work planned for FY 1988. It is anticipated that the analysis planned of the the 1985 registration can now be made of the 1987 registration. Data will be categorized and analyzed relating information on school systems or agencies (4 categories), grade placement (20 categories), visual acuity (9 categories), and reading medium (5 categories). Additionally, the average age of students in various of the categories will be computed. A full report of this study will be made.

Future Trends in the Education of Blind Persons (continuing)

Purposes: (a) To obtain information to use in planning for APH, (b) to obtain information to use in planning APH's research program, and (c) to obtain information to use in a program for APH's 1986 Annual Meeting

Project staff: June Morris, Project Director  
Paul Lewis, Supervisor of the Florida Instructional  
Materials Center, Project Associate

Background. In January 1986, letters were sent to 25 persons, representing a variety of programs, who were selected because they were, or recently had been, in positions enabling them to have a broad perspective of the field of education for the blind. The letter requested their ideas about what would be happening in the field in 5 years. A 138-item questionnaire was developed from the responses received and sent to 35 knowledgeable persons in the field requesting responses on a likelihood scale and a desirability scale for each item. Responses were returned by 89%.

Work during FY 1987. In addition to providing planning information, data from the questionnaire were analyzed and used for the informational content of one section of APH's 1986 Annual Meeting. Invited speakers made presentations based on the data, each addressing a specific area: Day Schools and Integrated Programs, Residential Schools and Integrated Programs, Technology and Materials, and Personnel Preparation. A report of the study was distributed at the time of the Annual Meeting.

Portable Plus Record Player (continuing)

Purpose: To prepare an owner's manual for the Portable Plus Record Player and to evaluate the machine's design and features

Project staff: Bob Glass, Project Director  
Larry Skutchan, Project Associate  
Jim Robertson, Project Development Department

Background. The Portable Plus represents a major advance in reading tools for the blind. In addition to traditional Talking Book player features, this lightweight unit is battery powered, has standard and variable speed controls, and contains a fully integrated speech compression circuit which permits the user to listen in compressed speech to external sources such as the APH Cassette Player/Recorder. It has been approved for production.

Work during FY 1987. Twelve Portable Plus prototype units and a draft of the owner's manual were evaluated during the Spring and Summer of 1986. Results regarding the overall unit were most positive; however, several modifications were suggested. Suggested changes related to slightly increasing the case size in order to accommodate larger records, reducing line interference within certain portions of the circuitry, offering variable speech compression as an option, improving the accessibility of control knobs and switches, and improving the user's control of the machine's start-up speeds. The manual was found to be written in a style and on a language level that was both comprehensive and easy to understand. Results were reported to the developers of the player and improvements to the design initiated.

Work planned for FY 1988. It is anticipated that a second generation prototype of the player will be available for a limited field trial and that small revisions to the owner's manual will be required.



The World Book Encyclopedia, Disk or CD Edition (new)

Purpose: To provide a special edition of the World Book Encyclopedia which would be accessed via technology

Project staff: to be determined

Background. APH has produced two special editions of The World Book Encyclopedia. The first was a braille edition of the 1959 reference work and the second was a recorded edition based on the 1978 and 1979 editions. Updated information was provided for the latter through provision of three supplements; The World Book Year Books for 1980 and 1981, 1982 and 1983, and 1984 and 1985. Due to the age of the main reference work, a decision was made not to produce any subsequent combined yearbooks. However, visually handicapped students need access to a major reference work such as this encyclopedia.

Work during FY 1987. A meeting was held with Peter Mollman, Senior Vice President and Director of Operations (manufacturing and technical operations) at World Book, to explore the possibility of working together to develop a special disk or CD edition of The World Book Encyclopedia for use by visually handicapped persons that could be accessed through technology commonly in use.

Work planned for FY 1988. If feasible, and if a sufficient market is deemed to exist, APH will undertake this project.

Needs Study: Academic Materials (new)

**Purpose:** To obtain market information about the field's current needs for academic materials

**Project staff:** to be determined

Background. Periodically, APH queries its customers regarding their perceived needs for special educational materials to serve the visually handicapped persons for whom they are responsible. At the May 1987 meeting of APH's Educational Research and Development Committee it was suggested it might be timely to do so again; specifically, in regards to needs for academic materials.

Work planned for FY 1988. A questionnaire will be developed and sent to appropriate agencies requesting specific information about their needs for special academic materials.



Agencies Participating in Research

In addition to the agencies named here, appreciation is also extended to the many other agencies which cooperated with APH's research efforts by permitting members of their staffs to serve as consultants or respondents to requests for information.

Apple Computer, Inc.; Cupertino, California  
Carr School; Lincoln Park, Michigan  
Cleveland Elementary School; Livonia, Michigan  
Colorado School for the Deaf and the Blind; Colorado Springs, Colorado  
Detroit Public Schools Program for the Visually Handicapped; Detroit, Michigan  
Expert Systems Software, Inc., Nashville, Tennessee  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
Fremont Unified School District; Fremont, California  
Jefferson County Public Schools; Louisville, Kentucky  
Johnson Elementary School; Denver, Colorado  
Kentucky Department for the Blind; Frankfort, Kentucky  
Kentucky Rehabilitation Center for the Blind; Louisville, Kentucky  
Kentucky School for the Blind; Louisville, Kentucky  
Lawton Elementary School; San Francisco, California  
Loma Vista Elementary School; Vallejo, California  
Marin County Office of Education, San Rafael, California  
Minnesota Educational Computing Corporation (MECC), St. Paul, Minnesota  
National Federation of the Blind, Baltimore, Maryland  
National Special Education Alliance, Cupertino, California  
New York Institute for Special Education, Bronx, New York  
New York Vision Program and Services; New York City, New York  
Oakbrook Educational Center; Philadelphia, Pennsylvania  
Pinellas County Schools; St. Petersburg, Florida  
Public School 90; Queens, New York  
RC Systems, Bothell, Washington  
St. Lucy's Day School; Philadelphia, Pennsylvania  
Sensible Software, Birmingham, Michigan  
Sliwa Enterprises, Inc., Yorktown, Virginia  
Starr King Exceptional School; Carmichael, California  
Stonewall Jackson Elementary School; Bristol, Virginia  
Street Electronics Corporation, Santa Barbara, California  
Tennessee School for the Blind; Nashville, Tennessee  
University of North Carolina Infant/Preschool Program for Visually Impaired Children; Chapel Hill, North Carolina  
Valle Verde Elementary School; Walnut Creek, California  
Veterans Administration Hospital, Birmingham, Alabama  
Visually Impaired Preschool Services; Louisville, Kentucky  
Weber City Elementary School; Weber City, Virginia  
Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania  
Whited Elementary School; Santa Rosa, California



Consultants

Braille Language Program

Dr. Samuel C. Ashcroft, Professor Emeritus, Peabody College, Vanderbilt University, Nashville, Tennessee

Mrs. Helen Berry, Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Mrs. Debbie Mullarkey, Teacher of the Primary Visually Handicapped, Leawood School, Columbus, Ohio

Dr. Joseph M. Petrosko, Professor and Statistician, University of Louisville, Louisville, Kentucky

Mrs. Mary Powers, Consultant for the Visually Handicapped (Retired), South Carolina State Department of Education, Columbia, South Carolina

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- Glass, R. D. (1986, July). Using APH microcomputer materials in residential school settings. Louisiana School for the Visually Impaired, Baton Rouge, LA.
- Glass, R. D., & Ruconich, S. (1987, March). Special education technology for blind people. Graduate School of Education, University of Louisville, Louisville, KY.
- Glass, R. D., & Skutchan, L. D. (1987, April). Apple computer materials for visually handicapped students from the American Printing House for the Blind. 65th Annual Meeting of the Council for Exceptional Children, Chicago, IL.

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## New Products

### Microcomputer Related Products

#### Hardware

Echo Commander: A Complete Speech Synthesis System  
Echo Commander: Control Unit  
\*Speaqualizer

#### Computer Literacy

Talking Apple Literacy Kit: Apple //e Edition (Teachers)  
Talking Apple Literacy Kit: Apple //e Edition (Students)  
Braille Keyboard Model

#### Utility Programs

TEXTALKER  
Sensible Speller: Talking APH Edition  
Talking Utilities for ProDOS  
\*Talking Utilities for DOS  
\*Teacher's Pet

#### Educational Software

Speaking Speller  
MECC: Elementary Volume 1--Mathematics  
\*MECC: Elementary Volume 5--Prefixes  
\*MECC: Food Facts  
\*SEI: American History I  
\*SEI: U.S. Government  
\*SEI: Vocabulary Builder  
\*SEI: Word Analogy

#### Recorded Manuals

Apple II ProDOS User's Manual  
Running MS-DOS

### Educational Aid and Tools

Light Box Materials: Level III  
Game Kit  
Lights On: Learning to See  
\*Fine Motor Development Materials: Twist, Turn, and Learn  
\*Handi-Cassette Record Player

\* to be released during first half of FY 1988











**American  
Printing House  
for The Blind  
Incorporated**

**Department of Educational Research**

**Report of Research and Development Activities**

**Fiscal 1988**

**American Printing House for the Blind  
1839 Frankfort Avenue  
Louisville, Kentucky 40206**





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The research and development program conducted by the Department of Educational Research at the American Printing House for the Blind (APH) is a multifaceted one that has grown and evolved since its inception in the early 1950s. Its initial charge, as posed in 1952 by the Research Committee of the American Association of Instructors of the Blind, was (a) to do educational research pertinent to production at APH and (b) to do research on any educational problem of sufficient importance among the schools to require study and clarification. The mission of the program today remains true to its initial charge. The research program is now an inherent part of APH and its efforts affect educational and rehabilitation programs serving visually handicapped persons throughout the United States.

The work described in this report reflects priorities previously determined by APH's Educational Research and Development Committee; namely, to continue development of software and hardware related to use of microcomputers by visually handicapped people, to continue development of materials for individuals with multiple handicapping conditions, to make a concerted effort in the development of early childhood products (many of which overlap with materials for multiply handicapped persons), and to continue a commitment to braille. In addition to these, the research program continues to address product needs in the areas of low vision and educational measures as well as maintaining efforts to identify the field's greatest needs for educational and/or rehabilitation materials in all areas. Other research describes the population served under The Act To Promote the Education of the Blind and looks at questions of importance to educators.

The program described in this report is optimistic in that budget constraints may limit some of the proposed activities. During FY 1988 APH's educational research activities were financed through the federal appropriation and a \$50,000 grant from the Special Education Programs, Office of Special Education and Rehabilitative Services, U.S. Department of Education, which partially underwrites development costs of a braille language program. Additional funds will be required to continue the same high level of activities during FY 1989.

In addition to research and development activities, the research staff continues to work closely with other phases of APH's work. These include working with production personnel during initial runs of new products; working on a continuing basis with production personnel on improvements to existing products; working with marketing personnel in the development of product brochures and other promotional materials; and serving in the support of products by answering queries from customers, manning exhibits, and conducting workshops. Other activities include organizing and participating in APH's summer seminars, conducting special workshops such as the 1987 Special Materials Workshop for University Personnel held in conjunction with APH's



Annual Meeting, and providing special programs for groups of professionals who visit APH. At the same time, the research staff continues to participate in general professional activities of the field.

The Department of Educational Research is fortunate in having broad support from APH's Ex Officio Trustees, its Educational Research and Development advisory committee, and the field at all levels as well as from APH's Board of Trustees and staff. Cooperation within APH is exemplary. Without such, it would not be possible to maintain an effective research program.

Supporting all research activities are a research library and a model shop which are maintained as part of the Department. Research staff, as well as other professionals working in the field, regularly avail themselves of the unique collection of professional literature that is housed in the library. The model shop provides designs for and models of conceptualizations of future products incorporating all required specifications; translates the conceptualization of future products into designs that are feasible for production; makes numerous preliminary models; provides experimental models used in field-testing; develops production prototypes; and often designs and produces specialized tooling needed for production. The ability to translate research into reality is one of the great strengths of the research program at APH.

Following are brief descriptions of the various research and development projects that were underway in FY 1988 and that are planned for FY 1989. For each, information is given as to its purpose, project staff, background, and current and planned activities.

Early Childhood



Home-Based Media Approach for Developing Critical Skills in Young Visually Impaired Children (continuing)

Purpose: To develop both print and media materials, targeted for professionals and parents, to assist in developing critical skills in visually handicapped children, birth-24 months

Project staff: Sheri Moore, Project Director  
Gary Berger, Technology Liaison and Manufacturing Specialist

Background. There are two main products which have resulted from this project. These include a guidebook, Beginnings: A Practical Guide for Parents and Teachers of Visually Impaired Babies and a slide-cassette program, "Playing the Crucial Role in Your Child's Development." Both products are designed for the professional or parent working with visually handicapped children, birth-24 months. Initial work on the project was funded through a grant from Special Education Programs of the United States Department of Education.

Work during FY 1988. The slide-cassette program, "Playing the Crucial Role in Your Child's Development" was translated from slide-cassette format to VHS videocassette format. This was accomplished through reshooting each slide and copying it onto a master videocassette using a specialized charge coupled device (CCD) camera. The VHS format will be useful to professionals working in the home environment because of its portability; the cost has also been reduced in the new format.



Fine Motor Development Materials: Twist, Turn, and Learn (continuing)

Purpose: To design and develop a set of tangible materials useful in developing critical fine motor functions for visually handicapped and blind children, birth-48 months

Project staff: Sheri Moore, Project Director

Background. The Fine Motor Development Materials: Twist, Turn, and Learn are designed to assist young and multihandicapped visually impaired students in developing, refining, and reinforcing small motor functions. Eight modular units are constructed to assist in developing fine motor skills such as reaching and grasping, raking or whole hand use, pincer grasp, wrist rotation, searching technique, palmar grasp, visual-motor, and visual-perceptual coordination. In addition, the teacher's guide details a number of additional skills which can be developed using the Fine Motor Development Materials, including visual attention and focusing, object permanence, cause-effect relationships, imitation skills, orient auditorily, flexibility of digits, and so on.

Work during FY 1988. Project staff worked with production personnel on the manufacture of the eight modular units. The final edited copy of the accompanying teacher's manual was also readied for publication. A final expert review was conducted on the tangible materials as well as the manual.

Work planned for FY 1989. The final report of the Fine Motor Development Materials will be written. This report will detail project activities from the needs assessment process through the final expert review phase.

Visually Handicapped Infant/Toddler Curriculum and Training Project  
(continuing)

Purpose: To develop a personnel training curriculum specific to blind and visually handicapped children birth through 2 years and to conduct a series of regional inservice training programs, paralleling the curriculum content, throughout the nation

Project staff: Sheri Moore, Project Director  
Karen Peters, Project Assistant

Background. The 1986 early childhood materials needs assessment meeting prioritized infants, including the multiply handicapped blind/visually impaired infant. The primary reason for this infant emphasis was the group's assessment of the critical nature of early intervention and the need for specifically developed educational and curricular materials to assist in preventing significant developmental delays. During FY 1986, two grants were written and submitted to obtain funding for this project. Neither proposal was funded.

The impact of blindness on an infant's development is documented and substantial. Numerous research studies indicate the importance of teaching parents of blind and visually impaired children early stimulation techniques and strategies for coping with their children and their own feelings. Failure to provide a stimulating and appropriate early environment leads to developmental lags, atrophy of the sensory systems, and to eventual developmental regression. The increasing survival of very low birthweight babies presents an array of vision related problems. Increasingly, infants with visual handicaps also have additional problems and, for these children, early intervention becomes even more important. With the growing numbers of blind and visually handicapped infants/toddlers and the advent of Public Law 99-457, the goals of this project are critical and timely.

Work during FY 1988. Significant time was spent developing and conceptualizing a definitive project plan and, subsequently, trying to obtain funding for it. As defined in the project plan, the purposes of this project are (a) to develop a comprehensive curriculum for use with vision specialists and professionals in allied disciplines addressing the specific concerns of early intervention for blind and visually impaired infants and toddlers, birth through 2, and (b) to validate the curriculum through a series of inservice training programs to such professionals. The project utilizes the expertise of both university personnel and practitioners working in the field in the development of the curriculum and the provision of inservice training. Strengths of the design are that it enables the most highly qualified persons from throughout the country to participate in the areas of their greatest expertise.

Additional project activities included the following: research and identification of curricula for both nonhandicapped and handicapped infants and toddlers; literature searches for books, journal articles, and other references and resources relevant to nonhandicapped and handicapped infants

and toddlers; and survey and identification of family systems approaches/parent training literature for multihandicapped and handicapped infants and toddlers. Other activities included the identification and survey of five longstanding programs serving blind and visually handicapped infants and toddlers who utilize a multidisciplinary team; determination of team members and their respective responsibilities for a model service delivery system; and identification and survey, on a national basis, of the content of professional training programs (preservice and inservice) designed for working with nonhandicapped and handicapped infants and toddlers; also identification of any curriculum materials used in personnel preparation.

Work planned for FY 1989. The project plan follows this basic strategy: identify and confirm, via consumers, the topical areas most critical for vision and related personnel to work with infants and toddlers. Examples of topics to be addressed in the curriculum include Visual Training and Assessment, Neurodevelopmental Techniques, Working with Families, Assessment and Programming of Critical Skills, Multihandicapped Visually Impaired Infants, the Impact of Visual Loss on Development, and so on. Then, identify and recruit professionals from a variety of disciplines who are expert in the given topical area. Have the expert professional write a curriculum section or chapter on the designated topic. Send this draft for peer review by consumers, followed by necessary revisions. Also, provide for review by national early childhood special education experts. Use the written curriculum chapters as the basis for a series of inservice training/validation, to be offered on a regional basis throughout the country. These processes will serve as a validation for the curriculum. These strategies meet the project goals of developing a curriculum model and validating it via a series of inservice training programs for professionals working with blind, visually impaired, and multihandicapped infants, toddlers, and their families.

The methods and activities for realizing project goals and objectives are many. Basically, activities for the 36-month project period can be summarized as follows:

Year 1--Project planning--Evaluate and revise, as needed, identified critical topical areas by consumers (used as basis for curriculum topics); Identify curriculum content writers with expertise in identified topical areas; Initiate curriculum development process with detailed outlines.

Year 2--Write curriculum chapters on identified topical areas--Conduct formative evaluation process; Refine curriculum chapters through peer, consumer, and expert review processes; Plan validation process via inservice training programs.

Year 3--Conduct curriculum validation process--Conduct regional inservice training throughout the United States; Revise curriculum, based on evaluation of validation/inservice training participants; Complete project evaluation; Conduct dissemination activities.



Developing Literacy: Basic Skills, Concepts, and Early Experience  
(continuing)

Purpose: To provide a program for teachers and parents of young visually handicapped children to assist them in providing, from birth, the experiences and interaction necessary to develop and interrelate skills for literacy

Project staff: Suzette Wright, Project Director  
Josephine Stratton, Project Author

Background. Literacy, in the broad sense, refers to an individual's ability to speak, listen, read, write, bring meaning to and get meaning from symbols. The current project focuses upon bringing meaning to and getting meaning from symbols. Development of literacy, in this sense, does not begin with a child's first exposure to school and readiness lessons; it begins at birth, as basic motor, communication, perceptual, and social skills develop and as concepts take form. Interrelationship of early skills and concepts is key to their continuing refinement and to the development of literacy. The infant's first interactions with a parent or caregiver--simple reciprocal exchanges--develop communicative skills in a social context, concepts of the infant's body, and stimulate sensory awareness. As the communication--talking, simple songs, and games--is repeated in daily routines, the infant gradually attaches meaning to the gestures, vocalizations, and words. The ability to communicate, meaningfully, forms the foundation of literacy: it enables the child to bring meaning to symbols. In addition, the young child needs to develop skill in visual and hand exploration of the environment, forming a wide range of concepts and adding to the store of meaning he/she brings to symbols. It is also important the child develop skills in order to get meaning from symbols. Through exploring the environment, the child will begin to recognize naturally occurring symbols for identifying everyday objects, and will come to understand the usefulness of written symbols on signs and labels, and the function of lists, notes and other forms of written communication. Listening to and enjoying read-aloud stories is particularly important for developing the understanding that written language is a way of communicating and that it has meaning. Research shows that rich, early experiences with read-aloud books is highly correlated with a child's reading ability in later years. The need for beginning books for young children was given a high priority at a 1986 early childhood needs assessment meeting.

The current project will provide, in a print document, the framework for the development of literacy from birth and will suggest activities which may assist a visually handicapped infant or child. Storybooks, containing tactile and visual graphics appropriate for a young blind or low vision child, will be developed; suitable commercially available products will be recommended.

Work during FY 1988. A final proposal document was completed in October 1987. It reflected information contained in over 50 sources concerning the development of early skills, concepts, and experiences which contribute to literacy. Recently published, additional references were also reviewed during this time. A detailed timeline of project objectives was designed. Seven consultants were selected to serve on a committee to guide initial work and review written and tangible materials as these are developed. Each consultant



offered special expertise in areas relating to the project: language development, early concept development, reading, general infant and early childhood development, and extensive experience teaching visually handicapped infants and preschoolers, and interacting with parents. The first meeting of the committee was held in January 1988. The committee discussed the proposal document, confirming the view that literacy develops from birth. They emphasized the role of language, selecting to use the more inclusive term: communication. Areas where the needs of the visually handicapped child matched those of sighted children were discussed, as well as areas of special needs. Use of read-aloud books adapted to provide tactual interest, story "boxes," and other means of involving the young visually handicapped child in story-reading were explored. Based upon previous research and the committee's input, a theoretical framework for the project was established. This was used in developing the outline of a print document for parents and teachers. Work on the document was initiated. The first of three segments of the document is in draft form; the remaining sections are outlined. A survey was mailed to teachers of visually handicapped preschoolers concerning commercially available and teacher-adapted books they have used. Text and graphics for five original stories have been drafted and planned. Ideas for four additional storybooks have been proposed.

Work planned for FY 1989. The first draft of the print document for parents and teachers and prototypes of original stories will be completed and edited. Original stories will be completed and storybook prototypes created. Both the print document and prototypes will be presented to the project committee for review. Revisions will be made based upon their recommendations. An evaluation design will be devised and approved. Additional storybook prototypes will be constructed and the print document duplicated for distribution to teachers and parents for field evaluation. Field evaluation in five to seven sites is planned.

Infant Skills Project (new)

Purpose: To develop a collection of tangible child-use materials targeted for infants, birth-24 months

Project staff: Sheri Moore, Project Director  
Karen Peters, Project Assistant  
Suzette Wright, Project Associate

Background. A needs assessment meeting was conducted during the 1986 Council for Exceptional Children conference to develop recommendations for specific early childhood educational materials research and development projects. The committee delineated and set priorities for five specific areas, with the Infant Skills project receiving the highest priority rating.

Work during FY 1988. Extensive literature searches were conducted in a number of disciplines related to infants who are blind or visually handicapped. The literature surveyed included the disciplines of medicine, social services, medically related therapies, families, infant and child development, educational programs and services, and so on. Numerous journal articles and books were obtained and an annotated bibliography was developed of the most useful references. Many agencies serving young handicapped children and their families were contacted for relevant literature and information. A commercial materials search was conducted, both by computer and manually through catalogs, for educational materials designed for infants. Listings of these items were generated, along with skills that could be developed through use of these various materials. In addition, local businesses were surveyed for items popular with infants. A number of commercial items were purchased that had particularly interesting features for a visually handicapped infant, or which appeared a candidate for adaptation. Specifications were developed for materials to be designed by APH.

In several of these project activities, APH staff collaborated with the Visually Impaired Preschool Services (Louisville, Kentucky) staff to work on the project activities cooperatively. The Visually Impaired Preschool Services program has a similar materials development project at the state level.

Work planned for FY 1989. Project staff will continue to keep abreast of literature and commercial materials related to young visually handicapped children. Additional commercial materials will be obtained, as exemplary items are identified. Work will continue on developing a number of APH designed items specific for the infant visually handicapped child. A questionnaire will be formulated, distributed, and the resulting data analyzed for the purpose of querying teachers of infant blind children as to useful educational materials. A committee will be formulated to obtain the input and expertise of practioners working with blind babies and their families. In addition, a formative evaluation of these materials, designed to assist blind infants in developing critical skills, will be conducted. Activities to develop specific skills will be written to accompany the formative evaluation.

Preschool Learning Activities (new)

Purpose: To develop an instructional manual of sensory based learning activities appropriate for blind and visually handicapped preschoolers, ages 3, 4, and 5 years old

Project staff: Sheri Moore, Project Codirector  
Hilda Caton, Project Codirector  
Eleanor Pester, Project Associate  
Tom Poppe, Model and Pattern Maker

Background. Over the past 10 years, the APH has developed an array of educational materials specifically designed for early childhood and multihandicapped students. The majority of these items are targeted for children functioning at less than a 36 month level. A number of consumers have urged APH to begin developing a continuum of educational materials for the 3, 4, 5, and 6 year old age group. This is particularly timely, with many additional preschoolers being served through PL 99-457.

Work during FY 1988. Some preliminary planning for the Preschool Learning Activities project was conducted. Several staff visited the classroom of a preschool teacher who has developed an array of sensory based learning activities for young children. These learning activities/trays reflect a strong Montessori influence, stressing the need for a child to initiate, practice, and complete a skill independently. The activities are designed to address skills that often require a great deal of practice for young visually handicapped children, such as eye-hand coordination, scooping, squeezing, pouring, sorting, categorizing, and so on. The activities make use of environmental materials. For example, materials used include sponges, buttons, nuts, rocks, pennies, silverware, basters, water, marbles, magnets, beads, golf tees, cotton balls, clothespins, and so on.

Work planned for FY 1989. A committee of preschool vision teachers will be formulated to work with APH staff on this project. A meeting will be planned and convened for the purpose of developing specifications for the Preschool Learning Activities project. The consulting group of teachers will also be asked to generate sensory based activities, emphasizing those which have been well received and successful in their classrooms. In addition, staff will review relevant literature and commercial materials. The learning activity manual will be formatively evaluated by teachers of preschool children in a variety of program models and settings.



Early Childhood Microcomputer Applications (new)

Purposes: To familiarize staff with computer software designed for young children, and to assess its applicability and/or adaptability for young blind and visually handicapped children

Project staff: Sheri Moore, Project Director

Background. Prior to the Fifth Microcomputer Advisory Meeting, APH early childhood staff identified and reviewed literature on the use of computers with young children. In addition, staff familiarized themselves with an array of software designed for concept building with young children.

Work during FY 1988. The increasing trend of working with young children and computers was discussed at the Fifth Microcomputer Meeting. Specific to blind young children, it was determined that obtaining computer literacy early was a decided advantage. The advisory group recommended that APH staff should explore the use of computers with young totally blind children and, secondly, develop a beginning concepts talking software program for this specific audience.

APH staff conducted a number of activities related to obtaining background and information in the area of microcomputer applications for young blind children, including the following:

1. reviewed and evaluated 15 software programs designed for young children
2. reviewed and evaluated 10 software programs designed specifically for young handicapped children
3. sourced and reviewed literature related to computer use with young children
4. developed a resource file of both literature and software related to microcomputer applications for young children
5. developed and circulated a questionnaire to identify resource persons working with young visually handicapped children and computers

Work planned for FY 1989. The activities identified above (numbers 1-5) will be continued. In addition, a software program will be designed. The extent of the software development activity completed during FY 1989 will be dependent upon available programmer time.



Early Childhood Questionnaire--The Impact of PL 99-457 to the American Printing House for the Blind (new)

Purpose: To determine the impact of the new federal early intervention program, PL 99-457, on APH's services for young blind and visually handicapped children

Project staff: Sheri Moore, Project Director  
Karen Peters, Project Assistant

Background. A questionnaire was distributed to the 145 ex officio trustees on record with APH as of September 1987. Respondents were asked to include current school year 1987-88 counts of infants, toddlers, and preschoolers as well as 1990-91 projected counts. In addition, information was requested concerning numbers of multihandicapped visually impaired children and state resource people and programs in early childhood vision.

Specific questions included in the questionnaire are as follows:

1. What are your state's projections of blind and visually handicapped children for each of the categories: Infant/toddlers (birth through age 2) and preschoolers (age 3 through 5) for the years 1987-88 and 1990-91?
2. Of the children counted in item 1 (above), how many do you expect to meet APH quota registration criteria in each category?
3. Of the child count projections given in item 1, what percentage of these children do you estimate to be multihandicapped visually impaired?
4. List several programs and professionals in your state who have expertise in working with blind and visually handicapped children. Categorize by infant/toddler and preschoolers.
5. Detail any inservice or preservice personnel preparation programs in your state training vision teachers to work with infants, toddlers, and preschoolers.
6. Indicate the types of programs serving the children included in your child count projections. Include those students served by public school, residential school, private agencies, rehabilitation agencies, and other.
7. Comments.

Work during FY 1988. The questionnaire was written and distributed to all ex officio trustees. The data were recorded and analyzed. A report was written summarizing responses of the trustees to the questionnaire items. Specific tables were prepared for the purpose of efficiently summarizing responses related to questions 1, 2, 3, and 6. Results, implications of the data, and problems with the study are reported.

Responses to items 6 and 7 of this questionnaire have been very useful in updating and expanding field evaluation sites and resource personnel files. Over 100 evaluation sites and some 50 personnel were recommended to APH, by the trustees, to assist in research and development efforts for young children.

Early Childhood References and Resources (new)

Purpose: To research recent literature relevant to young blind and visually handicapped children and to develop a resource list of such references and resources

Project staff: Sheri Moore, Project Director  
Karen Peters, Project Assistant

Background. Two sessions of the APH 1987 annual meeting of ex officio trustees were devoted to young visually handicapped children. With the advent of PL 99-457 and its implications for APH and many trustees, this topic was particularly timely. To assist trustees and other annual meeting attendees, a comprehensive bibliography of early childhood vision references was compiled and distributed. Several other resource listings were also compiled and distributed including: professional journals, curricula, early childhood special education references, and assessment tools.

Work during FY 1988. A comprehensive, selected bibliography of recent early childhood literature, specific to blind and visually handicapped children, was researched and developed. This bibliography included some 140 references. All were relatively recent references, most being written in the past 5 years.

A listing of professional journals in the early childhood special education field was researched and developed. Another listing was developed of early childhood special education curricula, useful for developing and implementing educational programs. Assessment tools specific to early childhood special education were also listed in three categories: screening, diagnostics, and instructional program planning measures. A number of other references, useful in working with early childhood special education children, were also researched. These resources and references continue to be available to APH's consumers, upon request.

Preschool Orientation and Mobility Project (new--submitted from field)

Purpose: To evaluate an orientation and mobility curriculum designed for visually handicapped and multiply handicapped infants and young children, birth through 5 years of age

Project staff: Sheri Moore, Project Director, APH  
Karen Peters, Project Assistant, APH  
Everett Hill, Project Director, Preschool Project

Background. The Preschool Orientation and Mobility (O & M) Project was developed over a 3-year period at Peabody College of Vanderbilt University. Everett Hill was principal investigator of the federally funded model demonstration grant. The four major areas of the curriculum are formal orientation skills, formal mobility skills, gross motor skills, and fine motor skills. The orientation section incorporates the cognitive and sensory processes needed to develop initial orientation skills. The mobility component incorporates traditional initial mobility skills, but extended downward to the preschool level. The gross and fine motor areas for infants (birth-2 years) provide a foundation of motor behaviors which are needed in order to perform many formal O & M techniques. The motor section for preschoolers (2-5 years) focuses more on developing efficiency in locomotor skills, such as gait. There is also a special section of the curriculum for children who use ambulatory aids such as walkers, crutches, wheelchairs, and support canes.

In addition to the curriculum, two O & M screening instruments were developed. Screening A was designed for younger (0-2) nonambulatory children. The second O & M Screening, B, was designed for older (2-5) ambulatory children. The screenings were designed to be administered in a short period of time to give an overall impression of the child. Screening A includes the following areas: background information; gross motor skills; functional vision; auditory skills; tactile skills; body image; and concept development. Screening B encompasses the following areas: background information; auditory, tactile, visual functioning; motor skills; mobility skills; body parts and planes; positional concepts; home and community experiences; and orientation skills.

A field evaluation was conducted by the developers. The curriculum and screenings A and B were distributed to 64 O & M specialists and teachers of the visually impaired who had expressed interest in testing the tool. Of the original number, 30 individuals in 18 states responded by returning evaluative feedback information on all or portions of the curriculum. The evaluators varied considerably in teaching experience. Experience in teaching O & M ranged from 0-19 years (mean = 3 1/2 years) with 1/5 of the participants listing 0 years of experience in this area. Half of the participants were dually certified in both O & M and vision. Of the remaining participants, 8 were certified in O & M only and 7 were certified in vision only. Approximately 50% of the participants were employed by public school systems, 25% by schools for the blind, and 25% equally divided between state and private agencies serving the visually impaired. Twenty-three percent of the respondents were male and 77% were female.



The developers report that the field evaluators rated the curriculum as "very well received." Following is a statement by the principal investigator as to the evaluation results:

After testing specific skills with children on their caseloads, participants rated the curriculum as 'very useful' or 'somewhat useful' and made no suggestions for major revisions. Narrative comments supported the overall usefulness of the suggestions for teaching strategies and activities.

Word during FY 1988. Everett Hill, along with several project staff, met with APH personnel to explore the feasibility of APH distributing the Preschool Orientation and Mobility Project Curriculum and Screenings. The curriculum, screenings, and related project reports and data were reviewed by several members of APH's staff. Following this review, it was decided that the total curriculum and screening package should be evaluated by several experts outside APH in the preschool orientation and mobility field. To this end, three such experts were recruited to assist in this expert evaluation phase. APH staff developed two evaluations for use in compiling the expert reviewers comments. One evaluation is of a comprehensive general nature; the other evaluation is for summarizing strengths and weaknesses of each curriculum and screening section.

APH staff compiled and analyzed all expert reviewers comments. This information, along with APH staff impressions about the feasibility of producing the curriculum and screenings, was presented to our Educational Research and Development Committee of ex officio trustees. The decision was made not to publish the Preschool Orientation and Mobility Project.

Parents and Visually Impaired Infants (PAVII) (new--submitted from the field)

Purpose: To provide a variety of materials useful in developing individualized home based intervention programs for young children with visual handicaps

Project staff: Sheri Moore, Project Director, APH  
Deborah Chen, Project Director, PAVII

Background. The PAVII materials were developed through a federally funded project for the Blind Babies Foundation in San Francisco, California. Materials developed through the 3-year project are targeted for early interventionists and special educators providing home based services to families with visually handicapped infants, birth-36 months. There are six print booklets comprising project materials, as detailed below.

1. The Parent Assessment of Needs (PAN). A 9-page ecological inventory or interview/report form which helps parents to identify home based goals and prioritize objectives for their infants.
2. The Parent Observation Protocol (POP). A 17-page instrument for using a video "microteaching" format in parent-training. The format encourages parent observation of self and child, as well as identifies teaching strategies for facilitating early learning experiences.
3. PAVII "How-To" Papers on Assessment. This is a series of papers for home based assessment of infants and toddlers who are visually impaired.
4. The Art of Home Visiting. A 10-page paper which discusses roles/responsibilities and prerequisite competencies for a home visitor, offers practical suggestions for a home visit and issues encountered in the home visit process.
5. Getting Ready for School. A paper for parents considering preschool programs for children with visual impairments. The paper discusses the learning environment, family factors, child factors, school district factors, expert input, and educational rights.
6. Socially-based curriculum for Infants and Toddlers with Visual Impairments. This is a parent guide of home based strategies for daily routines which integrate cognitive, social, communicative, motor, and perceptual skills. The guide will include a brief discussion about the parent's role as "teacher," the home as a primary learning environment, and suggestions for typical routines such as meal time, bath time, bed time, play time, and going out.

Work during FY 1988. Correspondence was initiated by PAVII staff, requesting APH to consider publication of project materials. Materials were reviewed by APH staff. Time tables were determined for completion of final copy for each of the six major print components.

The PAVII materials were submitted to the Educational Research and Development Committee of ex officio trustees for publication consideration. The committee determined that the PAVII materials should be published by APH.

external expert review. The results of these evaluations will be compiled and analyzed. These data will assist APH staff and the Educational Research and Development committee in determining whether or not to publish the PAVII materials.

Multihandicapped





Multihandicapped Adolescent Project (continuing)

Purposes: To develop and evaluate community based learning activities designed to meet identified programmatic needs of adolescent multihandicapped visually impaired students and to develop and evaluate several tangible materials useful in training independent functioning in adolescent multihandicapped students

Project staff: Sheri Moore, Project Director  
Suzette Wright, Project Assistant

Background. The Multihandicapped Adolescent Project is targeted for students who have achieved basic skill levels and are involved in an educational program emphasizing self-care, independence, and life/community living skills. Written activities include age appropriate and environmental applications stressing skills useful in a group home living arrangement or community based living option.

Work during FY 1988. The prototype tangible materials, including a switch activated item and tactually distinct adhesive labels, were reproduced for field evaluation. The community based learning activities manual was written, stressing practical and experiential life skills orientation. Examples of content areas include: grocery shopping, preparing simple meals, using public transportation, mobility to neighborhood businesses, use/value of money, clothing selection, communication skills in the community, getting assistance in the community, ordering in a restaurant, laundering and caring for clothes, use of leisure time, and identifying universal symbols (exits, fire, etc.).

The activities are written at a basic level. They are designed to be used by staff inexperienced in working with the targeted group or paraprofessionals. An additional emphasis in the manual is on the use and development of the sensory processes in the acquisition of skills in the content areas presented. Regardless of category, all activities include environmental applications stressing the importance of developing independence, self-sufficiency, and community living/life skills.

The manual was distributed to several programs serving multihandicapped visually impaired adolescent students. A formative evaluation questionnaire was developed to assist the evaluators in critiquing the project materials. Evaluators were asked to determine the appropriateness of the materials, the usefulness of the manual and activities, and to evaluate each activity and content area. In addition, evaluating teachers and related professionals were asked to write additional activities and guidelines for using the manual, if such a need was identified.

In addition, project staff conducted a continuing literature search to familiarize themselves with related material in the area of community based instruction. Journal articles, media, curriculums, and books pertaining to sensory training, age-appropriate materials, the multihandicapped adolescent, daily living skills, community living skills, self-help skills, life skills, survival skills, group home living skills, and transition were perused.

Work planned for FY 1989. Data from the formative evaluation process will be posted and analyzed. Revisions to the project materials will be made, based on the formative data. Several expert reviewers, working specifically in the area of community based learning with multihandicapped visually impaired students, will also review project materials and critique them. Arrangements will be made with 10-12 programs to serve as field evaluation sites, reflecting both a program type and geographic distribution. Each site will be contacted with regard to the specifics of participating in the field testing, clearance with administration personnel, and obtaining student clearance, if needed. Evaluation and data recording forms will be constructed as the evaluation plan is finalized. Upon completion of the field evaluation, all data will be posted and analyzed. Revisions will be determined on the basis of the evaluation data. A final expert review will be conducted. Production specifications and instructions will be written, along with a final project report.

Task Oriented Inventory and Work Skills Program (continuing)

Purpose: To provide a program that will assess and include work skills activities for a process approach toward task oriented behavior with objects

Project staff: Bill Duckworth, Project Director  
Suzette Wright, Project Assistant  
Gretchen Stone, Project Author

Background. As indicated in past reports, the Austin Work Skills Evaluation, from the Texas School for the Blind, offered a great deal of excellent material for programming with young visually handicapped students with developmental delays as well as the moderately to severely multihandicapped student. The revision needed was a simple matter as the program was written. In working with the author, however, it was found that many of her ideas could be expanded and the program could include information for various populations of visually handicapped students. The program developed to be more a process of concept development for the limited student or the student with limited experiences than it was a program that led directly to vocational training. With the wide functioning range of the population needing prevocational training, it was deemed appropriate to expand the program for broader application. The program remains, however, a process of handling materials in a way leading to task-oriented behavior and to the development of work-related concepts which will serve as a basis for more specific training.

Work during FY 1988. Major redesign of the format of the materials was undertaken plus inclusion of refinements and explanations of many of the concepts. Drafts of all sections, with the exception of the Introduction, were completed.

Work planned for FY 1989. Further refinement of the program materials will be made so that an individual without experience with the program can readily understand the terminology and the scoring system. In addition the program will be subjected to a field evaluation by experienced professionals.





Low Vision



Bright Sights: Learning to See (continuing)

Purposes: To develop a kit of materials, divided into two levels of difficulty (sensory and perceptual), useful in assisting visually handicapped students functioning at a birth-36 month level to learn to use remaining vision, and to research current data regarding the effects of exposure to ultraviolet black light

Project staff: Sheri Moore, Project Director  
Suzette Wright, Project Assistant

Background. The Bright Sights: Learning to See materials utilize special fluorescent objects to stimulate and train the residual vision of multihandicapped and young visually impaired students. These materials can be used with or without the illumination of a black light and provide greatly enhanced color contrast and resolution. Fluorescent materials illuminated by a black light lamp have been particularly effective in establishing visual attending in young and multihandicapped visually impaired students who were previously not responsive to visual stimuli. Increase in attention span and transfer of tasks learned under black light to performance under ordinary illumination have been documented.

Work during FY 1988. In an effort to safeguard consumers, directors of the ophthalmology departments of all major medical centers and teaching hospitals, as well as organizations such as the National Eye Institute, were contacted during Bright Sight's development. Standards for ultraviolet (UV) exposure devised by the National Institute for Occupational Safety and Health (NIOSH) were obtained; these were developed based on NIOSH's experience with UV light and recommendations by the American Medical Association and American Conference of Government Industrial Hygienists. The black light lamp used with the Bright Sights materials was well within all established safety limits.

To insure the continued safety of consumers using the Bright Sights materials with a black light lamp, APH staff reviewed all current related research and talked directly to several of the principal investigators. It was concluded that caution should be exercised in using black light, even though black light lamps suited for vision training produce relatively moderate levels of long wave ultraviolet light. Research indicates individuals with aphakia, albinism, receiving photosensitizing drugs, or with other eye conditions which permit excess light to enter the eye or bypass the lens (aniridia, coloboma, subluxation of the lens) should not be exposed to black light unless ultraviolet-blocking eyewear is used. These individuals may be at risk for a variety of negative effects associated with exposure to long wave ultraviolet light. Research has not been conducted with phakic, human subjects to determine whether they also are at risk for eye damage



associated with exposure to moderate levels of black light. Albino mice exposed to moderate levels of black light for 12-hours daily have shown evidence of cataract formation and photoreceptor destruction after 60-70 weeks of exposure. Cataract formation and other eye disorders in humans have been linked to chronic exposure to bright sunlight, which contains relatively high levels of long wave ultraviolet light.

Because conclusive information is lacking, use of ultraviolet-blocking eyewear with every student is the most certain way to ensure complete safety. Untinted, ultraviolet-blocking lenses do not affect the fluorescent appearance of items used under a black light lamp; they do block direct and reflected ultraviolet light from entering the eye. Goggles which block UV light are commercially available only for adults. APH has developed a set of UV blocking goggles specifically designed and fitted for young children.

Work planned for FY 1989. Project staff will continue to monitor and to keep abreast of the literature on ultraviolet light exposure. In addition, a final report detailing all project development activities and processes will be prepared.

Bright Sights: UltraVisor (new)

Purpose: To develop a means of blocking ultraviolet light from reaching the eye during vision training performed under black light which also does not diminish the visibility of the training materials

Project staff: Suzette Wright, Project Director  
Tom Poppe, Model Maker

Background. Prompted by the lack of information concerning the effects of black light (a form of ultraviolet light) on students with visually handicaps, the American Printing House for the Blind has investigated the feasibility of using filters and eyewear which block ultraviolet light (UV) from reaching the eye. Filters placed over the lamp were found to block the fluorescence of materials used under black light, greatly reducing their visibility; filters placed between the child and materials prevented the student from handling materials during vision training activities. Untinted, UV-blocking eyewear, however, provided the necessary blockage of UV light, did not affect the appearance of the materials, and enabled students to handle the items freely. APH, consequently, recommended that students using black light be provided with eyewear which blocks ultraviolet light (UV) from reaching the eye.

In an effort to help consumers locate appropriate eyewear, commercial sources were contacted and samples were obtained. Although inexpensive, UV-blocking eyewear sized for adults was readily available, child-sized eyewear of this type was not found. (Child-sized frames are available and can be equipped with UV-blocking lenses, however these must be custom fitted and range in price from \$25-35). It was decided to develop the appropriate eyewear in-house to meet this specialized need. A number of different UV-blocking materials and dyes were investigated. The need to fit infants, toddlers and older children in a manner which was as unrestrictive as possible, offered a wide viewing range, and blocked overhead UV light as well as reflected light from below presented a designing challenge.

Work during FY 1988. Low-cost eyewear meeting all established criteria was designed and successfully fitted to children ranging from infancy through school age. The UltraVisor provides almost total blockage of UV light without disturbing the appearance of materials. It consists of a visor cap with an adjustable headband; the UV-blocking visor is riveted to the brim of the cap. Production of the UltraVisor was approved.

Lights On: Learning to See (continuing)

Purpose: To develop a set of light activated materials that are useful in developing remaining vision in young and multihandicapped visually handicapped students functioning on a birth-36 month level

Project staff: Sheri Moore, Project Director

Background. The Lights On: Learning to See items are designed to provide an array of materials useful in promoting the development of basic visual skills. Visual skills to be developed include light awareness, eye-hand/body coordination, and color discrimination.

Work during FY 1988. Project staff have worked closely with production personnel to evaluate several items that have been modified by the manufacturer. Items have been critiqued for safety, durability, and function.

Work planned for FY 1989. A final report will be written detailing all phases of the project. A detailed outline has been developed which will assist in this activity.

Assessment of Visual Potential Instrument (new)

Purpose: To develop an assessment instrument useful in evaluating the visual potential of young children with multiple impairments and a visual handicap

Project staff: Sheri Moore, Project Director  
Beth Langley, Directing Editor

Background. Beth Langley, author of the Functional Vision Inventory, has developed a working draft of an instrument specifically designed to measure visual potential in lower functioning visually impaired multiply handicapped children. This instrument, tentatively entitled Assessment of Visual Potential, contains six major sections as listed below.

1. physical readiness
2. level of stimuli processed
3. level of response
4. compensation
5. visual components
6. summary and impressions

Within each major section, there are numerous subsections. For example, the physical readiness section contains some 14 subcomponents including: behavior state, medication, state of alertness, pupil reaction to light, eye alignment, eye reaction to vestibular input, postural movement, quality of tone, quality of movement, point of stability, head control, head righting, head/shoulder dissociation, and midline orientation.

Work during FY 1988. APH staff met with Beth Langley to discuss the working draft of the Assessment of Visual Potential. Critical components of such an assessment were identified. Also, the array of relevant literature in a number of disciplines that needs to be researched and incorporated was determined.

Work planned for FY 1989. APH staff will work with Beth Langley in developing a cooperative agreement to further develop and refine the Assessment of Visual Potential. A schedule will be developed, detailing a time line of project activities. Relevant literature will be sourced and studied. Additional consultants, in various content areas, will be utilized throughout the development process as expert reviewers.





Braille



Read Again: A Program for Adventitiously (Recently) Blinded Persons  
(continuing)

Purpose: To develop a set of materials designed to teach braille to persons who have lost their vision after initially learning to read print

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Fred Otto, Assistant Editor

Background. A complete set of materials was designed to teach braille reading to persons who have lost their vision after initially learning to read print. This set of materials was reviewed by the project's consulting committee. Pending revisions, the program was approved for production by APH's Publication Committee. Revisions of two of the beginning units introducing braille letters, numbers, and basic punctuation were made and the units were again reviewed by the committee. The committee's major suggestions this time involved incorporating the practice worksheets and reading applications throughout the units whenever possible rather than putting them at the ends of the units. Following this meeting, these units were once again revised to reflect these organizational changes. The tactual discrimination unit was also revised to conform to the language of revised units, completing work on the part of the program which deals with Grade 1 Braille. Then the part of the program dealing with Grade 2 Braille was revised and new reading applications were selected.

Early in the project a survey of 200 adventitiously blind people learning braille was made to provide information for the development of the materials. An article describing the survey was written, submitted for publication, and rejected.

Work during FY 1988. Additional practice readings were selected, copyright permissions were secured, and some readiness materials of special relevance to the target population were written. The entire program was copyedited and content problems were cited. The staff met together, reviewed the entire program, and made decisions about the problems that had been cited. Following this meeting, further copyediting was done based on decisions the group had made. The program was also checked for consistency, completeness, and clarity of rules and definitions. Additional practice materials available from APH were referenced. Detailed specifications were written for braillying, and one copy was marked for typesetting and another for recording before the program was turned over to production.

A revised article on the survey of the adventitiously blind was submitted to Education of the Visually Handicapped for publication consideration. An article on the sequencing of the presentation of the braille code for adults and the final report will still be written.



Patterns: Prebraille Program (formerly entitled Braille Readiness Program)  
(continuing)

Purpose: To develop a comprehensive, sequentially organized braille readiness program

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Fred Otto, Assistant Editor  
Karen Peters, Assistant Editor

Background. Patterns: Prebraille Program is a learning readiness program which was designed for use with visually handicapped children before they begin the readiness level of a basic reading program. This program contains 80 lessons which help visually handicapped children develop their auditory, tactual, conceptual, and language abilities. It incorporates a number of readiness materials already available from APH and supersedes the Tactual Road to Reading program. This program was evaluated in use at field test sites in California, Kentucky, and Ohio during the 1985-86 school year. APH's Publication Committee has approved it for publication. Data collected during the field testing were used to make final revisions in the readiness program.

Work during FY 1988. Final preparations for production were made in the readiness materials. Production specifications were developed. The material was all turned over for production and is expected to be available for the beginning of the 1988-89 school year. The final report will still be written.

### Braille Language Program (continuing)

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Karen Peters, Research Assistant  
Eddy Jo Bradley, Directing Editor  
Eric Hamp, Linguist

Background. This project is funded under a grant awarded to the APH by the Federal Research in Education of the Handicapped Program's Field Initiated Research competition which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, US Department of Education.

Work began on the project in January 1984. Information on achievement in language, spelling, and word study skills was obtained through administration of a special braille edition of the Stanford Achievement Test, Intermediate I, Form E by teachers to 57 blind 4th and 5th grade students to identify specific problems blind students have. Analyses were made of current spelling and English textbooks and of Patterns: The Primary Braille Reading Program. This information was used to develop the program.

The program will consist of four levels, Levels A, B, C, and D. The first level of the program, Level A, was drafted, reviewed, revised, and sent to pilot test sites for evaluation. The consulting committee met and reviewed the Level A materials. Further revisions were made based on these evaluations. Level A materials were placed with 56 students and 30 teachers at 25 field test sites and visits were made to the sites at the beginning of the school year to explain the field evaluation procedure and at the end of the school year to administer a mastery test of the level.

A similar procedure will be followed with each of the succeeding levels. Level B has been drafted, reviewed, revised, and sent to pilot test sites for evaluation. The consulting committee has met and reviewed the Level B materials, and further revisions were made. Planning for Level C was begun.

Work during FY 1988. Level A tests which had been completed were scored and the data were analyzed. Level B materials were prepared and sent to field test sites for use with students as they were ready for them. Field test sites were visited. Since progress has been a little slower than was anticipated, students involved in the field testing are not yet ready for the test on Level B. Level C materials were completed and sent to the pilot test sites for review. Planning for Level D was begun.

Work planned for FY 1989. Final revisions based on the field evaluations will be made in the Level A materials in preparation for production. Field testing of the Level B materials will continue. Level C materials will be prepared and sent to the field test sites as the students are ready. The Level D materials will be drafted.

Braille Spacing and Size for Beginning Adult Readers (new)

Purpose: To determine the optimum spacing and size for initial presentation of braille to beginning adult readers

Project staff: Eleanor Pester, Project Director  
Karen Peters, Research Assistant  
Joe Petrosko, Design and Evaluation Specialist

Background. Although little is known about the effects of spacing and size on the introduction of braille to adults, indications are that both play important roles in braille code recognition. Nolan and Kederis (1969) found that recognition of characters by 36 skilled braille readers in grades 4 through 12 was significantly influenced by the distance between dots and their location within the cell. Books for young beginning braille readers are generally double-spaced (interlined) in accordance with the standards for braille books. Milback (1954) and Hoffman and Cook (1970) suggest double-spacing both between lines and between words to aid young braille readers in discrimination. In a study done by Newman (1984) with 80 sighted male subjects, learning was facilitated by using large braille cells. Both braillewriters and slates and styluses are available for producing enlarged braille either with an enlarged dot or with a standard sized dot in an enlarged matrix. At least one braille program for adults, Braille Series, 1960, provides enlarged braille practice materials in three sizes--very much enlarged, moderately enlarged, and slightly enlarged braille. Some rehabilitation counselors feel they have better results when braille is presented initially to adults with more than the usual space around the braille characters, and some feel that enlarged braille is especially useful for teaching braille to people with decreased tactual perception. Others feel enlarged braille should not be used. Research is needed to determine optimum spacing and size for initial presentation of braille to beginning blind adult readers.

Work during FY 1988. A study was designed which compared the performance of 40 blind adults who knew little or no braille on a randomly ordered series of tasks which presented braille characters in standard and enlarged braille with one, two, and three spaces between characters and with one or two line-skips between braille lines. The data were analyzed and results showed that regardless of the size of braille used, the space between characters, or the skips between lines, subjects got about the same number of items correct. Enlarged braille took subjects a longer time to read than standard size braille. The 11 diabetic subjects performed about the same as the nondiabetics, both on number of items correct and speed of performance. In contrast, the 6 subjects who were more than 70-years old got significantly fewer items correct than younger persons. These results were applied to Read Again which will be produced in standard braille only. Following some additional analyses of the data, the final report will be written and an article was written and submitted for publication.

Braille Line Length Study (new)

Purpose: To compare reading speed and accuracy under three conditions--(1) paper with 40 cell lines, (2) paper with 20 cell lines, and (3) VersaBraille with 20 cell lines

Project staff: Eleanor Pester, Project Director  
Hilda Caton, Assistant Director  
Joe Petrosko, Design and Evaluation Specialist

Background. With the advent of paperless braille devices such as VersaBraille, the question of the optimum length for a braille display has arisen. At the present time, cost is a big factor in limiting the length of the display line. However, if a longer line was found to be sufficiently superior to the 20 cell line in general use, the increased cost might be justified. As APH plans for an optional braille display with its PocketBraille, and as technology and cost become less limiting factors, line length becomes an important question. Surprisingly, to date a review of the literature has turned up no research on this question.

Work planned for FY 1989. A study will be designed and executed to compare reading speed and accuracy of experienced adult VersaBraille users under the three conditions described in the purpose.



Linguistic Analysis of American Literary Braille, Grade 2 (new)

Purpose: To conduct a thorough and systematic linguistic analysis of American Literary Braille, Grade 2, which will incorporate the new braille terms developed for Patterns: The Primary Braille Reading Program

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eric Hamp, Linguist

Background. At the present time, no systematic analysis of American Literary Braille has been conducted. The British have completed a major contraction study of their system which includes frequency of occurrence of contractions in written text. That study, however, did not consider a grouping of braille configurations (contractions) which was different from the grouping now in use. The study proposed for American Literary Braille would use the new terms (groupings) used in the braille reading and language programs developed at APH for an analysis somewhat similar to the British study. This study would include the following steps:

1. Selection of appropriate text materials for the analysis
2. Marking (or bracketing) of the braille configurations defined in Patterns: The Primary Braille Reading Program
3. A count of the frequency of occurrence of those elements in the text materials
4. Revision of the order and groupings of braille rules in the publication English Braille: American Edition with an emphasis on more effective orders and groups for teaching purposes

Work planned for FY 1989. The initial marking (or bracketing) of elements will take place in the Fall of 1988. The remainder of the work will be done in 1989.

## Educational Measures



Brigance Diagnostic Comprehensive Inventory of Basic Skills (green)  
(continuing)

Purpose: To provide a tactile supplement to this Inventory for use with blind students in kindergarten through grade 9

Project staff: Bill Duckworth, Project Director

Background. Format and a labeling system were worked out to provide a tactile supplement for this Inventory to be used in conjunction with the print edition.

Work during FY 1988. All activities were assigned labels and the first five volumes, with their accompanying materials, were produced. Curriculum Associates, the publisher of the print edition, displayed the materials and one braille supplemental volume at its booth at the International Council for Exceptional Children Convention.



Brigance Diagnostic Inventory of Early Development (yellow) (continuing)

Purpose: To provide a tactile supplement to this Inventory for blind children ages infancy through 7

Project staff: Bill Duckworth, Project Director  
Jo Stratton, Research Intern

Background. While this Inventory is being revised, with a new edition expected to be published in 1988 or 1989, the publisher has said most of the competencies will remain in the same order with much of the material remaining intact. Much of the adaptation of format has been done in the past with a research intern who had expertise with this age group. All activities have been assigned a label as to what steps the teacher will take in assessment such as using the supplement, using the print edition with modification, etc. One section, General Knowledge and Comprehension, was completed and evaluated to determine if the format was appropriate.

Work during FY 1988. Waiting for the revision to take place

Work planned for FY 1989. Curriculum Associates notified APH that the plans to revise this inventory have been delayed. Adaptation will be completed when the revision is published.

Needs for Educational Measures (continuing)

Purpose: To identify norm referenced and criterion referenced academic tests for which braille and/or large type editions are needed

Project staff: Bill Duckworth, Project Director

Background. Surveys were conducted of commercial test publishers, the APH Slate readership, and psychologists working with visually handicapped persons in an effort to learn (a) which academic measures are the most widely used and (b) specific tests needed for use with visually handicapped people. Tests suggested included: the Detroit Tests of Learning Aptitude (large type), Woodcock Reading Mastery Tests (braille), Kaufman Assessment Battery for Children (braille), Iowa Tests of Basic Skills (braille and large type), Brigance K & I Screen for Kindergarten and First Grade, Brigance Preschool Screen for Three- and Four-Year Old Children, and the Stanford Achievement Series, latest edition (braille and large type).

Work during FY 1988. The Stanford Achievement Series, the Brigance K & I Screen, and the Brigance Preschool Screen were selected for further consideration with top priority being given to the new Stanford series. (See section on Stanford Achievement Test, Form J of Series 8.)

In a continuation of the effort to identify academic measures that are needed, but not available in braille and/or large type editions, a survey was conducted querying 31 materials resource centers serving visually handicapped students and selected residential schools maintaining academic programs. (See section on Academic and Test Needs Survey.)

Computer Administration of Academic Measures (continuing)

Purpose: To investigate the possibilities of administering academic measures by way of computer

Project staff: Bill Duckworth, Project Director

Background. For the ease of administration, scoring, and record keeping it seems quite plausible to determine if some types of academic tests could or should be placed on computer disks so that the braille and large type user would be able to take these tests in this way. The braille user would use the voice synthesizer along with braille and graphics where needed. Problems of doing this for the large type user have yet to be identified other than the changing of format for placement of large type on the screen. Tests presently offered on computer were examined. To do this, test corporations were queried to determine what is presently being produced along this line. Most tests found available were not academic but personality, occupational preference, etc.

Work during FY 1988. Testwriter from Micro Media Publishing was found to have all the components that were felt to be important in administering a test on a computer. Test items from the Stanford Achievement Series were placed on the disk and the administration allowed a review of a question but changing mode was complicated. It also allowed storage of the students incorrect answers on the disk. Many markings which are used in pencil and paper tests and in braille tests had to be changed to be read on the screen. This is especially true for large type users. Several adults took the test and it was found that the test was a greater indicator of the person's expertise with a computer/synthesizer than it was of the knowledge of the material being tested.

Work planned for FY 1989. One subtest of the Stanford Achievement Series will be tried with several high school students where computers are used in a manner to verify familiarity. If the speech component does not give problems with these students then a study will be developed that will compare the results of a limited number of students taking one form of the subtest on the computer and the other form with paper and pencil.

Stanford Achievement Test, Form J of Series 8 (new)

Purpose: To adapt into braille and large type one form of the latest edition of the nation's most widely used achievement series

Project staff: Bill Duckworth, Project Director

Background. Continued contact with The Psychological Corporation, the publisher of the Stanford Achievement Series, obtained for APH the opportunity to be involved in the planning stages of the Stanford Achievement Test, Series 8. The series looks promising in that APH has had input into the item selection. Additionally, The Psychological Corporation has volunteered to renorm any subtest from which it is necessary to omit items in the braille edition. This edition is unique in that each level of the test is for one grade level only. The levels to be modified begin with 2.5 to 3.5. This presents APH with the possibility of offering only one form of the test.

Work during FY 1988. Psychological Corporation sent APH the item pool for the Stanford Achievement Test, Series 8. All test items that would pose a problem for the braille edition were flagged. Whenever possible, The Psychological Corporation avoided using these items in the final item selection for the series. This process seems to have been effective. In the Primary 2 level of Form J, only one subtest (Environment) had to be dropped and 6 questions from another of the subtests. This is in comparison to two entire subtests and 12 questions dropped from the braille edition of this level in Series 7.

Work planned for FY 1989. Nine levels of Form J of the Stanford, Series 8, will be adapted for braille and large type editions. The manuals will be written for administration of both Forms J and K so as not to rule out the possibility of later adaptation of Form K. This is to be a secure form for which states may contract with The Psychological Corporation to use. Additionally, Form K may be used for research purposes.





Microcomputer Applications  
Process and Information Dissemination



Fifth Microcomputer Advisory Meeting (series)

Purpose: To identify and prioritize needs for educational materials to support use of microcomputers

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Project Assistant  
Bob Glass, Project Assistant

Background. An advisory group was formed in 1984 to provide specific information and guidance on a continuing basis in the area of technological needs and applications. Four microcomputer needs meetings were held with the advisory group at APH. They were in August 1984, March 1985, October 1985, and in September 1986. As a result of these meetings, a list of greatest needs, moderate needs, and least needs was generated. Many of the greatest needs identified have been addressed by members of the Department of Educational Research at APH resulting in an exciting line of microcomputer related products for visually handicapped persons.

Work during FY 1988. The Fifth Microcomputer Advisory Meeting was held September 14-16, 1987. In addition to (1) completing work underway, the other project given top priority was to (2) continue working on enhancements to the APH PocketBraille (PB):

- aim toward miniaturization
- modify editor to be more usable
- write a calculator program
- write a tutorial usable by students and teachers
- reorganize the manual starting with easy and/or common uses and progress to more difficult or less often used features and applications
- pursue a braille display for the PB
- put a strap or handle on the PB
- continue to make Screen Door enhancements
- offer workshops on how to use PB

The other greatest needs identified at this meeting were:

- (3) Design and develop a new version of the Talking Literacy Kit that would be usable on all current models of the Apple II family.
- (4) Design and develop a kit of materials to introduce students and teachers to telecommunications.
- (5) Great need was expressed for a handheld talking calculator with more functions than the \$60 Sharp.
- (6) Investigate the use of computers with young totally blind children.
- (7) Develop a talking software program for young blind children based on information acquired from investigation.
- (8) Enhance documentation of Teacher's Pet to include use as a grammar program.
- (9) Make an adapted version of the Sunburst BASIC programming series available.



- (10) Make a tactile coloring book (similar to tactile pictures produced using Hal Stringer's Illustration program) available for totally blind children .
- (11) Pursue making the Appleworks manual available on disk.
- (12) Continue to adapt MECC software as time permits.
- (13) Work with Debbie Sugg on making a version of IBM (R) program, Writing to Read, available to visually handicapped children.
- (14) Give preconference workshops in strategic locations on APH computer-related products as time allows.
- (15) Develop some kits of materials that can be used by qualified individuals to provide workshops on APH computer-related products.
- (16) Make Number Cruncher, a high-level talking calculator program, available from APH.

In addition to the greatest needs listed, the advisory committee made several general recommendations to APH.

Work planned for FY 1989. A sixth meeting of the Microcomputer Advisory Committee will be conducted in September of 1988 to review progress, discuss current projects, project future activities, and reprioritize the needs in this area.

Survey of Products Being Used and Products in Need of Development for Legally Blind Persons Using Microcomputers (continuing)

Purpose: To determine the greatest needs of the field and set priorities appropriately by gathering information on the current "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons

Project staff: Debbie Willis, Project Director  
Fred Otto, Project Assistant

Background. When APH became interested in developing microcomputer related products in the summer of 1983, it was necessary to determine the greatest needs of the field and set priorities appropriately. Information regarding the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons was gathered during the fall and winter of that year. Recognizing, however, that this is a rapidly changing field, a second survey was conducted in the winter and spring of 1986. The data from the 200 questionnaires were recorded.

Work during FY 1988. A portion of the data obtained in the second survey was analyzed and reported at the Fifth Microcomputer Advisory Meeting for the purpose of planning and decision making. Selections of the data were used at various times throughout the year in making decisions regarding computer-related products.

Work planned for FY 1989. In order to keep current, a third survey is planned.

Observation and Information Dissemination (continuing)

Purpose: To gain more insight into user problems by observing students at the computer and to disseminate information on current uses of technological aids through workshops and presentations

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Project Assistant

Background. The Fourth Microcomputer Advisory Committee recommended the microcomputer group help disseminate information about relevant technology to the field. Additionally, the meeting of the interim committee in May 1985 resulted in a strong recommendation that the microcomputer group observe students using APH computer products. To this end, the microcomputer group conducted the summer workshops in June 1986, presented microcomputer materials at several conferences, and observed students on a weekly basis at the Kentucky School for the Blind.

Work during FY 1988. The microcomputer group continued presenting APH microcomputer materials at relevant conferences. In addition, the group observes, on a weekly basis, students of all ages using a variety of software in a class conducted in the evenings at the Kentucky School for the Blind. Interested users that visit APH also receive detailed product demonstrations upon request.

Work planned for FY 1989. The microcomputer group plans to continue with presentations and the observation of students and users when possible.

Product Evaluation (continuing)

Purpose: To evaluate user satisfaction with APH microcomputer products, to monitor and improve project planning and management, and to continue the identification of users of APH microcomputer materials

Project staff: Bob Glass, Project Director  
Debbie Willis, Project Associate  
Larry Skutchan, Systems Programmer

Background. From the first software product published by APH, all microcomputer materials have included a self-addressed, postage-paid "User Survey Card" which asked for information which would identify the consumer, product, setting in which the product is used, strong and weak points of the product, suggestions for improvement, current equipment accessible to the user, number of users and their age/grade range, and additional comments. As an assessment instrument for evaluation, these cards provide a valuable source of information which will aid in the decision-making process of the staff involved with improving existing products, determining future needs and projects, and monitoring trends in the categories above. These cards also serve as a vehicle for identifying users of APH microcomputer materials.

Work during FY 1988. The user survey cards were collected. Complete information from approximately 1/3 of those received were entered into a database. Results of the entered data were reported at the Fifth Microcomputer Advisory Meeting. The consumers' names and addresses were entered in a separate database to receive copies of the Micro Materials Update.

Work planned for FY 1989. The complete information from all the user survey cards will be entered into a database. This information will continue to be entered as more cards are received. The data will be analyzed periodically to study trends, revise current products, and assist in future planning. These cards are also useful in identifying persons to serve as reviewers of computer-related products, and in indentifying persons to participate in APH's Microcomputer Advisory Committee Meetings.

The names and addresses of new consumers will continue to be entered in the database of those who are to receive copies of the Micro Materials Update.



Information Dissemination: Micro Materials Update--newsletter (continuing)

Purpose: To provide a description of completed, ongoing, and planned APH microcomputer materials development projects to serve as a (a) newsletter for professionals in the field, (b) convenient means of responding to requests for more information, and (c) handout to distribute at appropriate presentations/workshops/exhibits

Project staff: Bob Glass, Project Editor  
Debbie Willis, Contributing Writer  
Larry Skutchan, Contributing Writer

Background. The first Micro Materials Update was generated specifically for the purpose of serving as a handout for a teacher in-service presentation made by APH staff in November 1985. Initially 40 copies were produced for that workshop and 20 were brought back to Louisville. The leftover copies provided such a convenient method of responding to requests for more information that more copies had to be produced. Three months later, a second issue of 250 copies was needed. In its fifth issue, Winter 1987, 3,000 copies were necessary to keep pace with request for more information. At this time, writing style was lightened to be less technical and intimidating for novice computer users and the format was expanded to include a forum for the field, "News, Views, and Muse from the Field."

Responsibility for the Update was divided between research and marketing staffs. Research was responsible for the content of the newsletter, maintaining the database, and for providing an address label printout of consumers known to have an ongoing involvement in special education technology. Additionally, the entire Winter 1987 newsletter was placed on SpecialNet and CompuServe.

The mailing list has been growing, providing research and marketing staffs with a valuable access to the individual users, teachers, rehabilitation counselors and instructors, and parents who are actually buying and using APH software and related products.

Work during FY 1988. The Micro Materials Update was updated and disseminated in print and braille once during FY 1988. The database of readers continued to be maintained. The Update was provided as a handout at several presentations, workshops, and exhibits this fiscal year. The Update was also used as a response to innumerable phone calls and letters regarding APH's computer products.

Work planned for FY 1989. Research staff involved in special education technology are frequently approached by individuals in the field to aid in the centralization or dissemination of information resources related to microcomputer applications with the visually handicapped. Current plans call for maintaining that part of the newsletter specifically related to APH's

microcomputer products, and expanding this vehicle to include an open forum for professionals in the field who wish to comment on APH's microcomputer products. At this time, the newsletter will continue to be updated and disseminated on a semi-annual basis free of charge. However, cost and worth will have to be determined in considering the future of the publication.



Microcomputer Applications  
Products





## APH PocketBraille (continuing)

Purpose: To develop a portable note-taking device

Project staff: Larry Skutchan, Project Director  
Bob Glass, Project Assistant

Background. The Kentucky Department for the Blind developed the PocketBraille and PortaBraille. Each is a complete portable note-taking system with braille keyboard, parallel and serial ports, and a speech synthesizer. The PortaBraille additionally contains a braille display. Each contains firmware that makes writing and editing possible. With the approval of the Educational Research and Development Committee, APH began designing a version of this system.

Work completed in FY 1988. Several enhancements were made to the original code as supplied by the Kentucky Department for the Blind. These include the design, installation, and debugging of a real-time reverse translator that lets the user type text in Grade 2 Braille and have it spoken or printed in English; additional speech prompts to cover every function; modifications to the Screen Door firmware that let the user track the computer's cursor and monitor a selected screen position; and formatting routines. In addition, the microcomputer group licensed and installed a new text-to-speech algorithm. Several new commands that make navigation easier were also installed. When these enhancements were tested, an addendum to the original manual was written. The APH PocketBraille and its manual were turned over to production in January 1988.

The Screen Door for the Apple II also received some design changes that permit it to perform two additional functions not available on the board's original design. They are the ability to detect a keypress on the Apple's keyboard, and the ability to function properly on the Apple IIGS.

Prototype boards for the IBM version of the Screen Door were ordered.

A file transfer program originally intended for use in transferring files from the Apple to and from the APH PocketBraille was dropped in favor of letting users employ already existing software for the purpose.

Work planned for 1989. Development in the months that follow will focus in two areas: improved user interface with respect to files and an improved editor. The microcomputer group also plans the installation of a calculator. Firmware for the IBM version of the Screen Door will also be installed and tested. When this firmware is developed, the microcomputer group will field-test a number of the boards to verify the board's design and finalize the firmware. Final revisions to the Apple version of the Screen Door will also be completed.

Echo Commander (continuing)

Purpose: To provide a flexible speech synthesis control system for the Apple which includes the ability to control the speed of the synthesizer through a greater range than normally provided through software control

Project staff: Larry Skutchan, Project Facilitator

Background. The Echo Commander project began as a simple modification to a staff member's synthesizer. Every teacher and user that saw the system in use marveled at its flexibility.

The research staff obtained approval for the product from the Educational Research and Development Committee in May 1986 and negotiations with Street Electronics for modified circuit boards began.

Recognizing that thousands of users already own an Echo synthesizer, APH decided to offer the new system in two configurations; the complete system includes the circuit card, external speaker box, and TEXTALKER software. It includes everything needed to begin using speech on the Apple II. (The Echo Commander will not work on an Apple //c.) The control unit consists of the control box which is wired to the user's existing synthesizer.

Work completed during FY 1988. The Echo Commander project is complete. Work during the year consisted of monitoring customer questions and impressions. All have been positive.

Work planned for FY 1989. The Echo Commander project is complete and no future work is anticipated.

## Manuals (continuing)

Purpose: To provide manuals in braille, large type, recorded, or disk form to support use of commonly used microcomputer equipment and programs

Project staff: Debbie Willis, Project Co-director  
Bob Glass, Project Co-director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Fourth Microcomputer Advisory Meeting, it was recommended that APH continue to provide manuals deemed important in a medium usable by visually handicapped persons. In April 1986, Apple offered to supply APH the ASCII text files of Apple manuals for editing and dissemination by APH. The significance of this gesture resides in the fact that an individual possessing the ASCII text file of any work has the ability to output that information in hard copy (regular print, large print, or braille), refreshable braille, or synthetic speech. A manual reading program was conceptualized at APH, but did not receive top priority at the Fifth Microcomputer Advisory Meeting.

Work during FY 1988. The ASCII text files for the Apple IIGS Owner's Manual were received from Apple. Work on editing the disk version was begun and submitted to Apple for review. Apple approved of the edited version. As a result of Apple's review of the edited version, where text had been written to describe the various pictures, graphs, and diagrams, Apple made a commitment to have their writers provide APH with a special version of future Apple manuals. The Special Version would already have text-based descriptions inserted where pictures or diagrams occur in the original manuals.

Although the manual reading program did not receive top priority, it was decided to write a beginning level manual reading program for ease of reading text provided on disks. Editing of the Apple IIGS Owner's Manual was completed, page number references in the Table of Contents and index were converted to chapter number and heading number, the text file reading program was placed on the disk, and brief instructions on how to get started reading the manual on disk were written. These instructions will be provided in braille and large type.

The ASCII text files for the Appleworks Reference Manual and Appleworks Tutorial have been received from Apple Computer, Inc.

Work planned for FY 1989. After a final in-house review, work on the Apple IIGS Owner's Manual will be completed and it will be turned over for production. The manual reading program will be enhanced for inclusion on subsequent disk versions of manuals. The Appleworks manuals will be edited, instructions to be put into braille and large type will be determined, and the Table of Contents and indexes will be changed to reflect chapter and heading numbers. After an in-house review of the edited disk manuals, the disk versions will be turned over to production.



MECC Software (continuing)

Purpose: To adapt widely used educational software distributed by the Minnesota Educational Computing Corporation (MECC)

Project staff: Debbie Willis, Project Director  
Jeff Wheatley, Programmer  
Larry Skutchan, Systems Programmer

Background. Participants in the Second, Third, Fourth and Fifth Microcomputer Advisory Meetings and members of the Educational Research and Development Committee at APH's 1986 and 1988 Interim Meetings assigned high-priority status to the development of speech-adapted software from MECC. This challenge is particularly noteworthy because MECC materials are developed by educators and include a vast collection of titles already available to thousands of school systems nationwide. Additionally, many of the programs are designed for primary and elementary level students. Approval for production of speech accessible adaptations of the MECC software has been granted with the following priorities: 1. mathematics, 2. science and simple logic, and 3. English, social studies, and writing.

The talking version of Elementary Volume 1--Mathematics, designed for grades 3 through 9, was completed, reviewed by in-house staff and outside consultants, and sent to MECC for final approval. After approval was received, the software entered APH's production pipeline. It became available in January 1987.

Permission was sought and received from MECC to modify three additional selections. They are Elementary Volume 5--Language Arts (Prefixes), Food Facts, and Social Studies Volume 1. Each of these programs has been adapted for speech output, reviewed by in-house staff, and additional modifications made. Permission was sought and obtained from MECC to make a talking version of the Prefixes worksheets available on the same disk of programs. A quick study was conducted at the Kentucky School for the Blind to determine whether visually handicapped students would be able to use a talking crossword puzzle on one of the worksheets accompanying the Elementary Volume 5--Prefixes program. Modified versions of Elementary Volume 5 and Food Facts were evaluated by outside consultants. Observations of the students taking APH's computer workshop in the summer of 1987 were made.

Work during FY 1988. As a result of the final reviews and observations of students using APH's computer materials during the summer '87 workshops, Food Facts and Elementary Volume 5--Prefixes were further redesigned for ease of use and similarity of task that vision-oriented users of the programs must perform. The redesign required programming changes. The two programs' accompanying manuals were reviewed and found to contain valuable teacher/learner information. Permission was sought and obtained from MECC to include the original MECC manuals in these software packages. In addition to the original manuals, supplements discussing the changes and new operational features of the programs were written, reviewed, and edited. As a result of the revisions and suggestions made, it was decided to make the word lists used in Elementary Volume 5--Prefixes available in large type and braille in the software package.

Social Studies Volume 1 is ready to enter the evaluation place. Some redesign and, therefore, some reprogramming are anticipated as a result of the reviews.

Work planned for FY 1989. Food Facts, Elementary Volume 5--Language Arts (Prefixes), and Social Studies Volume 1 will be completed, sent to MECC for approval, and then turned over for production. Permission to adapt MECC's Writing a Narrative, a writing program targeted for sighted students in grades 7 through 9, will be sought. Assuming permission is received, work on this program will be started. Additional MECC programs will continue to be reviewed, appropriate programs selected, and permission sought to make adapted versions available to visually handicapped individuals.

Number Cruncher (new)

Purpose: To produce a talking calculator program

Project staff: Larry Skutchan, Systems Programmer

Background. Members of both the Third and Fourth Microcomputer Advisory Committee Meetings noted the need for a sophisticated, inexpensive calculator program. Such a program was discovered on the CompuServe network, the author was contacted, and permission to adapt the program was obtained. It is called Number Cruncher.

Work completed in FY 1988. The microcomputer group altered some of the Input/Output handling routines to better function with speech, and one particularly difficult section of the code was modified.

An introductory section to the original manual was written which describes, in a tutorial fashion, the methods the calculator uses for data entry. The remainder of the manual was also edited for clarity.

Work planned for FY 1989. Field evaluation and final reports are all that remain on the calculator project.

SEI Software (continuing)

Purpose: To adapt educationally sound, commercially available software for use by visually handicapped persons

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Meeting, a modified version of Sliwa Enterprises, Inc. (SEI) educational software series was given high priority. The content of each SEI program is appropriate for high school and college students as well as adults. APH was able to make an arrangement with SEI for a customized edition of 33 of these programs. The modified programs were reviewed; problems were identified and corrected. These programs have been approved for production.

Work during FY 1988. Before production, each disk is thoroughly checked for any factual or grammatical type errors; a camera-ready introductory page, title page, and reference guides are prepared to accompany the large type manual for each program. The same materials are also prepared for braille. SEI has complied with our request that the updated version of TEXTALKER be used on its disks to make the programs compatible with the Apple IIGS. At this writing, all 33 SEI programs have been turned over to production; four of these were available for sale this fiscal year.

Work planned for FY 1989. No further development is planned regarding the SEI programs. Project staff will work with production personnel as needed to complete the production of the remaining 29 programs. Sales of the programs will be monitored to determine the need for further activity.



Sensible Speller: Talking APH Version (continuing)

Purpose: To produce a talking spell checker

Project staff: Larry Skutchan, Systems Programmer  
Debbie Willis, Project Assistant  
Bob Glass, Project Assistant

Background. Sensible Speller is a spell checking program. With several requests from the field, the program's publisher, Sensible Software, Inc., agreed to produce a talking version of the speller. When the staff ordered a copy, they were horrified to note what had been done. The program was completely unacceptable. Research staff modified the program so that it used more conventional speech access techniques and gained approval from the Educational Research and Development Committee to produce the modified version of the program, which is now available.

Work completed during FY 1988. Minor bugs were found and corrected.

Work planned for FY 1989. The Sensible Speller project is complete. Future enhancements will be incorporated as suggestions dictate.

Speaking Speller (continuing)

Purpose: To produce a user-friendly spelling program

Project staff: Larry Skutchan, Systems Programmer  
Debbie Willis, Project Associate

Background. Members of the Third Microcomputer Advisory Meeting recommended modifying the spelling program which came on the disk supplied with the Echo II speech synthesizer. The program was used as a spelling quiz; the teacher types a list of words, and the student is given the word and asked to spell it.

After a thorough evaluation and examination of the code, the research staff chose to rewrite the program rather than attempt correcting several problems in the existing version. The result is Speaking Speller. Speaking Speller contains all the features of its predecessor, and includes several new capabilities. The program is also much more user-friendly. It was approved for production and is available from APH.

Work completed in FY 1988. As the microcomputer group saw some of the creative uses customers devised for Speaking Speller, several ideas were installed. They include enhancements that permit faster typing and a way of making a larger or smaller record size depending on the user's needs.

Work planned for FY 1989. This project is complete and future upgrades to the software will be dictated by responses from the field.

Speaqualizer (continuing)

Purpose: To produce a speech synthesis system for IBMs

Project staff: Larry Skutchan, Systems Programmer

Background. The Speaqualizer is a hardware based access package for the IBM computer. It permits the blind user to use speech to examine text displayed on the screen.

Speaqualizer was developed by the Research Committee of the National Federation of the Blind. After obtaining production approval from the Educational Research and Development Committee, APH research staff members began working with the National Federation of the Blind to continue development of the device's firmware.

Work completed during FY 1988. The microcomputer group identified several functions that could stand improvement. They were installed and included in the second run of the Speaqualizer. In addition, the microcomputer group obtained an updated text-to-speech algorithm and installed it into the system. These enhancements eliminated much confusion and made the system easier to use and understand. A new manual was written and the revisions were released as ROM revision 2.0.

Work planned for FY 1989. Development plans include making the current model of the Speaqualizer compatible with the model 25 and model 30, development of new hardware that uses the microchannel bus structure of the model 50 and model 60, and several firmware enhancements. These firmware enhancements include improving the means of identifying attributed text, adding additional monitor positions, and providing the user a way of masking off irrelevant material.

Sunburst's Meet the Computer--Beginning Topics and Meet the Computer--Intermediate BASIC (new)

Purpose: To adapt these sets of materials for use by visually handicapped students or clients who need to learn BASIC programming

Project staff: Debbie Willis, Project Director

Background. Members of the Fourth Microcomputer Advisory Meeting assigned a high priority status to reviewing Sunburst's BASIC programming series for possible adaptation for use by visually handicapped persons. These include Meet the Computer--Beginning Topics and Meet the Computer--Intermediate BASIC.

Both levels of the series were reviewed. The purpose of the beginning level is to teach a person how to write programs for the Apple II microcomputer. The programming language used to write the programs is BASIC. The beginning level includes a teacher's manual and sets of folders with lessons and activities.

The intermediate level does not include a teacher's manual. The format of the program is similar to the beginning level in that there are folders containing lessons and activities. At the end of each folder, in the first three sections, is a "Test Your Programming Skills" section. The answers to these exercises are on a 5 1/4 inch disk included in the set of materials.

This level introduces the learner to writing programs such as adventure games, math games, and games using animated graphics. The intermediate level of the program builds upon the concepts learned in the beginning level. The intermediate level is designed to follow Meet the Computer--Beginning Topics or a similar introduction to BASIC programming. Before using the intermediate level folders, it is necessary for many BASIC statements and commands to be understood.

These are excellent materials that are easy to use and understand. Lots of examples are provided. Important information to remember is pointed out. Each lesson builds on the previous one(s). The folders point out that if a particular concept is not understood, the learner should review that lesson before continuing. These materials would be good for itinerant teachers because only the necessary packet(s) of lessons/activities could be taken out of the kit and used with the student(s).

Work during FY 1988. Adapting these sets of materials was given high priority at the Fifth Microcomputer Advisory Meeting. Because of the workload, however, it was decided to delay work on this project until the next fiscal year.

Work planned for FY 1989. Sunburst will be contacted to see if some mutually beneficial arrangement can be agreed upon in order for APH to make adapted versions of these materials available to visually handicapped persons. Assuming permission is granted, work on this project will be started.



Talking Literacy Kit (TALK): Apple II Computers (continuing)

Purpose: To provide an introductory set of speech-accessible computer software and related materials for any of the current Apple (R) II family of computers which could be easily integrated into existing programs of computer literacy or introduction to computers for legally blind youth through adult beginners

Project staff: Debbie Willis, Project Director  
Jeff Wheatley, Programmer  
Larry Skutchan, Systems Programmer

Background. During the fall and winter of 1985, the Talking Apple Literacy Kit (TALK): //e Edition was in the production pipeline of APH. Production and pricing of the TALK: //e was completed in September 1986. First run sales were most encouraging. Subsequent runs of the materials were initiated and sales remained brisk.

Work during FY 1988. In the fall of 1987, APH was sent some legal guidelines by Apple Computer, Inc. regarding the use of Apple trademarks. In order to be in compliance with these guidelines, it was necessary to change the name of the kit of materials, the name of one of the software programs included in the kit, and all references to these in the print and recorded manuals.

At the Fifth Microcomputer Advisory Meeting, a revision of the kit to include all current Apple II computers received high priority. Work on the Talking Literacy Kit (TALK) for Apple(R) II Computers is underway. Work to date has included programming a few introductory games, a large print boot-up program, and a program that announces each key as it is pressed. Suggestions received on the //e Edition are being incorporated into the new edition. The new TALK for Apple II computers will include a flexible overlay for the Apple IIGS. Prototypes of the overlay were designed, developed, reviewed, revised, and turned over to production. The Brailled Keyboard Overlay for the Apple IIGS will also be sold separately from the kit in packages of five.

Work planned for FY 1989. An introductory word processing program will be included on one of the software programs. The software disk titled APH Presents the Talking Apple(R) will be reworked to include features of the Apple IIGS, new features of TEXTALKER(TM), and suggestions from the field. The manual will be updated and rewritten to include current information. The recorded manual will be changed accordingly. The computer parts collection in the kit will be reviewed. Components will be added, deleted, or changed as needed. An addition might include a 3 1/2-inch disk that can be taken apart for inspection. Suggestions for revisions of the overall kit made by members of the Fifth Microcomputer Advisory Committee will be incorporated into the new kit where appropriate. The final revised kit will be reviewed by at least two consultants.

## Talking Typer (continuing)

Purpose: To provide students/clients and teachers with appropriate software and documentation for use in teaching/learning with computers

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Meeting, a typing program called Kids Can! Typer, developed by Ted Hasselbring and Carol Hamlett for sighted special education students, was demonstrated and discussed. The advisory group gave a speech-adapted version of this program a high priority. APH acquired complete marketing rights to the speech-adapted version and contracted with Carol Hamlett to make the necessary programming changes.

An initial version of the adapted program (teacher disk, student disk, and documentation) was completed. The three components were thoroughly reviewed by in-house staff and several major "bugs" were found. A review of the entire program with suggestions for changes was sent to Carol Hamlett. While initial plans had not included adding speech to the teacher disk, Miss Hamlett reprogrammed that disk to make all the essential information being presented to the screen talk. A revised version was sent to APH. A preliminary review indicated there were still too many problems in the program's operation to send it out for evaluation. Therefore, more revisions were required.

Work completed during FY 1988. The majority of revisions that had been requested were programmed into the Talking Typer program. The programmer preferred to put off making some of the changes until the program has been used and some teacher/student/client preferences can be determined. Final sections of the manual were drafted. The program was reviewed thoroughly in-house and no major problems were found. The three components of the Talking Typer program were sent to a visually handicapped couple and one typing instructor for review.

Work planned for FY 1989. The Talking Typer program will be used by five students for evaluative purposes. The manual will reorganized, edited, and a final draft prepared. Minor modifications to the program will be made based upon the outside reviews done in FY 1988 and FY 1989. After the modifications have been made and the final version of the program has been approved by in-house staff, the Talking Typer program will be turned over for production. For a period of one year after the program is completed, Carol Hamlett will continue to make necessary revisions based on teacher, student, and client comments, suggestions, and criticisms.

Teacher's Pet (continuing)

Purpose: To produce a testing program

Project staff: Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant  
Debbie Willis, Project Assistant

Background. Larry Skutchan wrote a program several years ago that permits one to enter test questions so that the computer may be used to administer the test to a student. The program is called Teacher's Pet. He donated the rights to APH with the understanding that it was not perfect and that the documentation needed work. Production was approved by APH's Educational Research and Development Committee.

Work completed during FY 1988. Manual clarifications and minor bug corrections were made to Teacher's Pet.

Work planned for FY 1989. The Teacher's Pet project is complete. Future enhancements will be determined by responses and suggestions from the field.



TEXTALKER (continuing)

Purpose: To incorporate features specifically recommended by blind users into the TEXTALKER software and to set standards for use of speech synthesis on the Apple II

Project Staff: Larry Skutchan, Systems Programmer

Background. TEXTALKER is the software that works with the Echo synthesizers to provide the Apple with synthesized speech. It was written by Street Electronics. Members of the Third Microcomputer Needs Meeting recommended the program be modified to more accurately reflect the needs of the blind user and to help set standards for talking software. The research staff gathered information from several sources including a survey conducted by Bob Glass, the suggestion files at Street Electronics, comments from end users, and observations of users in the field. With the cooperation of Street Electronics, several improvements were added to the system that both enhanced productivity and increased ease of use. One of these features, the ability to silence any text with any keystroke, has, indeed, become a standard not only on the Apple, but in many IBM screen access packages. (APH's own Speaqualizer supports this feature.) APH's initial version of TEXTALKER was released as version 3.1.1. Later, with the introduction of the Apple IIGS, TEXTALKER received changes that permitted it to function at the new computer's higher processing speeds. This and enhancements that enabled the user to define columns for reviewing purposes were installed and the program was released as version 3.1.2.

Work completed during FY 1988. As the microcomputer group observed TEXTALKER users, three additional needs of the program became apparent. First, the program was modified so that the typist hears any keystroke pronounced even if the level of punctuation is set to "some." Secondly, support for the identification of inverse text was installed. Third, a means of quickly entering and exiting review was added.

In addition to the enhancements, the microcomputer group corrected some problems that date back to TEXTALKER's initial release from Street Electronics when there was only the Apple ][+. One of these involved the identification of inverse lower case letters. Another affected the instant silence feature on the Apple ][+.

Worked planned for FY 1989. The TEXTALKER project is complete. Future development efforts are aimed at making the system more transparent to applications software.



Utilities Disk (continuing)

Purpose: To produce a utilities disk

Project staff: Larry Skutchan, Systems Programmer

Background. Participants of the Third Microcomputer Advisory Meeting recommended that APH produce disks of most often needed utility programs that functioned with speech. This would allow the teacher and student to perform all the most needed disk maintenance operations with dependable talking software which would be available from one place.

The research staff obtained the source code to two of the utility programs from Apple Computer, Inc. and began modifying them.

Work completed during FY 1988. The microcomputer group found problems with the DOS 3.3 version of the utilities disk and rewrote the interface software. The resulting interface provides advantages over the original non-talking version, but required writing a new manual to explain its operation. Among the new features are menu selections for starting other disks not necessarily designed for speech and choices for making one's own talking boot up disk.

Work planned for FY 1989. The ProDos version of this project is complete. The DOS 3.3. edition awaits final evaluation.

Other Activities



Analysis of the 1987 Registration Data (continuing)

Purpose: To describe the legally blind population registered through APH

Project staff: Suzette Wright, Project Director

Background. Periodically, registration data are analyzed to document specific characteristics of legally blind students and clients registered under the Act to Promote the Education of the Blind. In order to clarify ambiguities in how these data were being reported, APH changed the format of the registration and, simultaneously, made some changes in the way information was to be reported. An attempt was made to analyze the 1985 Registration Data--the first to be reported subsequent to the changes made. Unfortunately, it was necessary to discontinue this analysis due to the many irregularities found in how the data were reported. APH's Editorial Staff made a major effort to clarify the instructions sent out for the 1987 registration so that all categories of information requested were clearly defined and mutually exclusive. This effort was successful, making an analysis of the 1987 data possible.

Work during FY 1988. During the latter part of 1987, a lengthy program was developed for the new computer system installed for management of the annual registration. The menu-driven program provides a means of tallying the numbers of students reported in each school/agency type (4 categories), grade placement (20 categories), reading medium category (5 categories), and visual acuity category (9 categories). Student age is also calculated. The program permits combined analyses of these variables, tabulating the distribution of students by one, two, and three defining factors. Data are produced in tabular form. With the assistance of APH's Editorial Department, 19 tables were generated based upon 1987 Registration Data. Tables were completed in March 1988. Some data were modified for the purposes of the analysis, which is based upon data from 41,227 students--96% of the total number registered in 1987. As expected, students registered through State Departments of Education formed the majority (83%) of registrants. Slightly over 10% of registrants included in the analysis were served in residential schools, 3% in multihandicapped facilities, and 3% in rehabilitation agencies. Although day and residential students were similarly distributed by grade placement, the analysis revealed differences in the distribution of these students by visual acuity and reading medium. Approximately 32% of all registrants were reported in grades 1-12; 18% were enrolled in infant, preschool, and kindergarten programs; 37% were reported as "other registrants," a placement reserved for school-age students who do not fit the definition of other grade categories. Slightly over 8% of all registrants were reported as "adult trainees," the only category available for students over school age. Much more information is contained in the 30-page written analysis of the 1987 Registration Data completed in the spring of 1988. This analysis, together with copies of all tables, is available from the Department of Educational Research upon request.

Work planned for FY 1989. The full analysis of the 1987 Registration data has been completed. Less lengthy reports focusing on a few related aspects of the data will be written and submitted for publication in journals.



The World Book Encyclopedia, Disk or CD-ROM Edition (new)

Purpose: To provide a special edition of The World Book Encyclopedia which would be accessed via technology

Project staff: not determined

Background. APH has produced two special editions of The World Book Encyclopedia. The first was a braille edition of the 1959 reference work and the second was a recorded edition based on the 1978 and 1979 editions. Updated information was provided for the latter through provision of three supplements; The World Book Year Books for 1980 and 1981, 1982 and 1983, and 1984 and 1985. Due to the age of the main reference work, a decision was made not to produce any subsequent combined yearbooks. However, visually handicapped students need access to a major reference work such as this encyclopedia, which is the most widely used encyclopedia for educational purposes.

Work during FY 1988. In a meeting with World Book personnel, two extremely significant things were learned. First, World Book is interested in working with APH on another "special" edition of its encyclopedia and, second, World Book has a clean 50 megabyte ASCII text file APH could use. The tape does not include graphics or tabular tables which means little editing would be required. Two possible versions were considered. One, which would provide for most efficient use, would involve CD-ROM technology. The other, which has the advantage in that the equipment is already in place in the schools, would be a floppy disk version which might be packaged similarly to the recorded edition (i.e., volumes/albums).

Work planned for FY 1989. Two decisions will be made. First, to determine if a sufficient market exists for APH to undertake this project and, if so, what form the product should take.

Academic and Test Needs Survey (new)

Purposes: To (a) identify specific academic materials needed in the areas of language arts, mathematics, science, and social studies; (b) to identify specific academic measures needed; and (c) to determine the sources of funds used for the purchase of special educational materials for visually handicapped students

Project staff: Bill Duckworth, Project Director  
Karen Peters, Project Assistant

Background. At its May 1987 meeting, APH's Educational Research and Development Committee recommended, "That the Department of Educational Research again survey the field to see if there are emerging needs in the science, mathematics, and social studies areas." At the same time, plans had been made to conduct a survey of test needs. These surveys were combined and expanded slightly in scope.

Work during FY 1988. A survey form addressing the above listed purposes was developed and sent, in the spring of 1988, to 31 instructional resource centers and 7 selected residential schools for the blind offering academic programs. For each of the academic areas queried, responses were in the form of specific texts and other teaching materials needed, as categorized by educational level (i.e., preschool/readiness, primary, elementary, middle school, and high school). Results indicated needs for a wide array of textbooks with little consensus between responding agencies/institutions. This information will be used by APH's Editorial Department in developing recommendations for texts to be produced by APH in braille and large type.

Work planned for FY 1989. A full report of the survey will be prepared.



Agencies Participating in Research

In addition to the agencies named here, appreciation is also extended to the many other agencies which cooperated with APH's research efforts by permitting members of their staffs to serve as consultants or respondents to requests for information.

Apple Computer, Inc.; Cupertino, California  
Blacow School; Fremont, California  
Carr School; Lincoln Park, Michigan  
The Carroll Center for the Blind; Newton, Massachusetts  
Central Pennsylvania Special Education Resource Center; Harrisburg, Pennsylvania  
Children's Center for the Visually Impaired; Kansas City, Missouri  
Cleveland Elementary School; Livonia, Michigan  
Colorado School for the Deaf and the Blind; Colorado Springs, Colorado  
Davidson Engineering; Morristown, Tennessee  
Detroit Public Schools Program for the Visually Handicapped; Detroit, Michigan  
Division of Blind Services; Lafayette, Louisiana  
Expert Systems Software, Inc.; Nashville, Tennessee  
Florida Association of Workers for the Blind, Inc.; Miami, Florida  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
The Governor Morehead School; Raleigh, North Carolina  
The Greater Pittsburgh Guild for the Blind; Bridgeville, Pennsylvania  
Illinois School for the Visually Impaired; Jacksonville, Illinois  
Jefferson County Public Schools; Louisville, Kentucky  
Johnson Elementary School; Denver, Colorado  
Kentucky Department for the Blind; Frankfort, Kentucky  
Kentucky Rehabilitation Center for the Blind; Louisville, Kentucky  
Kentucky School for the Blind; Louisville, Kentucky  
Lawton Elementary School; San Francisco, California  
Loma Vista Elementary School; Vallejo, California  
Meadowview Elementary School; Meadowview, Virginia  
Michigan Rehabilitation Center for the Blind; Kalamazoo, Michigan  
Minnesota Educational Computing Corporation (MECC); St. Paul, Minnesota  
National Federation of the Blind; Baltimore, Maryland  
National Special Education Alliance; Cupertino, California  
New Hampshire Educational Services for the Visually Handicapped; Concord, New Hampshire  
Overbrook Educational Center; Philadelphia, Pennsylvania  
Overbrook School for the Blind; Philadelphia, Pennsylvania  
Perkins School for the Blind; Watertown, Massachusetts  
Pinellas County Schools; St. Petersburg, Florida  
The Psychological Corporation; San Antonio, Texas  
RC Systems; Bothell, Washington  
St. Lucy's Day School; Philadelphia, Pennsylvania  
Sensible Software; Troy, Michigan  
Sliwa Enterprises, Inc.; Yorktown, Virginia  
Starr King Regular School; Carmichael, California  
Street Electronics Corporation; Santa Barbara, California  
Tennessee School for the Blind; Nashville, Tennessee  
  
Valle Verde Elementary School; Walnut Creek, California  
Visually Impaired Preschool Services; Louisville, Kentucky  
Weber City Elementary School; Weber City, Virginia  
Western Pennsylvania School for Blind Children; Pittsburgh, Pennsylvania



### Consultants

In addition to the consultants formally acknowledged in this section, appreciation is extended to the many individuals who have willingly given of their time and expertise in cooperating with the various research and development projects underway by responding to questionnaires, by answering less formal queries for information, and by working with research staff in countless ways such as: (a) identifying particularly talented teachers and other professionals to serve on committees and/or as expert reviewers; (b) recommending programs, teachers, and students appropriate for field evaluation sites; and (c) facilitating field evaluation efforts. Only through the splendid and continuing support of professionals working in the field and the people they serve is APH able to maintain its highly effective research and development program.

### Assessment of Visual Potential Instrument

Ms. Beth Langley, Teacher, Pinellas County Schools, St. Petersburg, Florida

Dr. Robert Scarpati, Optometrist, Hartford, Connecticut

### Braille Language Program

Dr. Samuel C. Ashcroft, Professor Emeritus, Peabody College, Vanderbilt University, Nashville, Tennessee

Mrs. Helen Berry, Teacher (Retired), Missouri School for the Blind, St. Louis, Missouri

Mrs. Debbie Mullarkey, Teacher of the Primary Visually Handicapped, Leewood School, Columbus, Ohio

Mrs. Mary Powers, Consultant for the Visually Handicapped (Retired), South Carolina State Department of Education, Columbia, South Carolina

Mrs. Sara Spivey, Teacher (Retired), Cobb County Schools, Marietta, Georgia

### Teacher Evaluators

Mr. Morris Anderson, Teacher of the Visually Handicapped, Johnson Elementary School, Denver, Colorado

Ms. Bridget Bassett, Primary Teacher of the Visually Handicapped, Overbrook Educational Center, Philadelphia, Pennsylvania

Ms. Georgia Beneicke, Teacher of the Visually Handicapped, Cleveland Elementary School, Livonia, Michigan

Ms. Joan Bliss, Teacher of the Visually Handicapped, Blacow School, Fremont, California

Ms. Robin Boyd, Teacher of the Visually Handicapped, Meadowview Elementary School, Meadowview, Virginia

Ms. Emily Fitzpatrick, Teacher of the Visually Handicapped, Weber City Elementary School, Weber City, Virginia

Ms. Jayne Harley, First Grade Teacher, Tennessee School for the Blind, Nashville, Tennessee

Ms. Karen Horne, Primary Teacher, Colorado School for the Deaf and the Blind, Colorado Springs, Colorado

Ms. Heddy Jacobson, Teacher of the Visually Handicapped, Mann School, Detroit, Michigan

Ms. Michelle Kelley, Primary Teacher, Colorado School for the Deaf and the Blind, Colorado Springs, Colorado

Ms. Doris Kingsmore, Primary Teacher, The Governor Morehead School, Raleigh, North Carolina

Ms. Susan Mangis, Teacher of the Visually Handicapped, Starr King Regular School, Carmichael, California

Sister Brian Mary, Primary Teacher, St. Lucy's Day School, Philadelphia, Pennsylvania

Mrs. Deborah Mason, Primary Teacher of the Visually Handicapped, Overbrook Educational Center, Philadelphia, Pennsylvania

Mrs. Margaret Navarro, Teacher of the Visually Handicapped, Carr School, Lincoln Park, Michigan

Ms. Jill Patton, Teacher of the Visually Handicapped, Lawton Elementary School, San Francisco, California

Ms. Collett Perry, Teacher of the Visually Handicapped, Valle Verde Elementary School, Walnut Creek, California

Ms. Deanna Scoggins, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Ms. Nan Sewell, Second Grade Teacher, Tennessee School for the Blind, Nashville, Tennessee

Ms. Marguerite Sgrillo, Teacher of the Visually Handicapped, Loma Vista Elementary School, Vallejo, California

Bright Sights/Black Light Safety

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Dr. Christine Kennedy, Director, Multihandicapped Program, Western Pennsylvania School for Blind Children, Pittsburgh, Pennsylvania

Ms. Beth Langley, Teacher, Pinellas County Schools, St. Petersburg, Florida

#### Preschool Learning Activities

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Ms. Katherine Robinson, Director, Children's House Montessori School, Louisville, Kentucky

#### Preschool Orientation and Mobility Project

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Dr. Everett Hill, Professor, Peabody College of Vanderbilt University, Nashville, Tennessee

Ms. Beth Langley, Teacher, Pinellas County Schools, St. Petersburg, Florida

Slates and Styli

Dr. Judith Dixon, Head of Consumer Relations Section, National Library for the  
Blind and Physically Handicapped, Washington, DC

Topical Seminar in Special Education

Dr. Sharon Bradley-Johnson, Director, School Psychology Program, Central  
Michigan University, Mt. Pleasant, Michigan

Visually Handicapped Infant/Toddler Curriculum and Training Project

Dr. Verna Hart, Professor, University of Pittsburgh, Pittsburgh, Pennsylvania

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|---------------------|---------------------------------|
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| Caton, Hilda, EdD   | Research Scientist (part time)  |
| Duckworth, Bill, MS | Librarian/Research Scientist    |
| Glass, Robert, MEd  | Research Associate (July-March) |
| Moore, Sheri, MS    | Research Scientist              |
| Morris, June, MA    | Director                        |
| Otto, Fred, BA      | Research Assistant              |
| Pester, Eleanor, MS | Research Associate              |
| Peters, Karen, BA   | Research Assistant              |
| Poppe, Tom          | Model and Pattern Maker         |
| Skutchan, Larry, BA | Systems Programmer              |
| Willis, Deborah, MA | Research Scientist              |
| Wright, Suzette, BA | Research Associate              |

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Hamp, Eric, PhD  
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Wheatley, Jeff



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- Pester, E. J. (1987, November). Current braille research and products at the American Printing House for the Blind, Iowa State Vision Conference, Ames, IA.
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New Products

Microcomputer Related Products

Hardware

APH Pocketbraille

\*Cassette Tape Interface Device (APH PocketBraille accessory)

\*6-foot Parallel Printer Output Cable (APH PocketBraille accessory)

Speaqualizer

\*Speaqualizer Upgrade Kit

Computer Literacy

\*Braille Keyboard Overlay for the Apple II GS (R)

Utility Programs

Talking Utilities for ProDOS (R)

Educational Software

SEI: American History 1

SEI: U.S. Government

SEI: Vocabulary Builder

SEI: Word Analogy

\*SEI: American Poetry

\*SEI: Ancient Civilizations

\*SEI: European History 1

\*SEI: High School Literature 1

\*SEI: Mark Twain

\*SEI: Mythology

\*SEI: Science Fiction

\*SEI: Sentence Completion

\*SEI: Shakespeare 1

\*SEI: Short Story

\*SEI: Steinbeck/Faulkner/Hemingway

\*SEI: United Nations and Foreign Governments

\*Teacher's Pet

Educational Aid and Tools

\*APH Portable Plus Record Player

Fine Motor Development Materials: Twist, Turn, And Learn

Handi-Cassette Record/Player

Parts Tray for Materials Carry-All

UltraVisor (Child Size)

Braille/Tactile Materials

\*Brigance Diagnostic Comprehensive Inventory of Basic Skills (Green):

APH Tactile Supplement

\*Patterns Prebraille Program

\*Products scheduled for release early in FY 1989

Existing Products Redesigned and/or Improved

APH Number Line Device

Box of Blocks: Geometric Forms (previously Geometric Forms)

Bright Sights: Learning to See (painted pegs to fluorescent pegs)

Chang Tactual Diagram Kit

Clock Face with Raised Print and Braille Numbers

Expanded Dolch Word Cards (previously Dolch Word Cards)

Geophysical Globe

Individualized Study Screen

Introduction to Measurement and Metrics (previously Introduction to  
Measurement in Mathematics and Metric Measurement Program)

Light Box Materials: Level I--face puzzle

Playing the Crucial Role/English (from slide cassette format to VCR)

Peg Kit

Script Letter Board

Sensory Stimulation Kit components--drum, feather duster, foam pillow, mirror,  
plexiglass color viewers, rattles, thing-mobile, weight bags









**American  
Printing House  
for The Blind  
Incorporated**

**Department of Educational and Technical Research**

**Report of Research and Development Activities**

**Fiscal 1989**

**American Printing House for the Blind  
1839 Frankfort Avenue  
Louisville, Kentucky 40206**



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The research and development program conducted by the American Printing House for the Blind (APH) during FY 1989 reflected the high priority areas identified by previous Educational Research and Development advisory committees. These included continued development of special materials for visually handicapped students/clients in the areas of: microcomputer related software and hardware, early childhood, multiply handicapped, and braille training.

A major organizational change occurred during FY 1989. APH has for many years been developing electronic devices and, more recently, those incorporating microprocessing technology. Personnel responsible for doing so have worked closely with research personnel in the Department of Educational Research. In January 1989, a change was made in which this group and the research department joined in what became the Department of Educational and Technical Research. Bob Phelps is head of the newly formed Technical Research Division. This division not only bears responsibility for the physical development of new products involving technology, but also for shepherding first runs of many new products through production.

Funding for the research program during FY 1989 has been primarily through the federal appropriation supporting the Act to Promote the Education of the Blind. Additionally, a federal grant from the Office of Special Education and Rehabilitative Services of the U.S. Office of Education has provided partial support for development of a Braille Language Program to parallel APH's Patterns series. Activities of the Technical Research Division were supported, in part, by APH.

Research and development activities have been hampered by the need for additional personnel having expertise in specific areas. These included early childhood, programming, and electrical engineering. In January 1989 Rob Meredith joined the research staff as a Programmer filling this critical need.

As always, research staff remained closely involved with services provided by APH. It has been responsible for the summer seminar program, has participated in many product support activities, and engaged in an array of typical professional activities. Of great importance is the fine cooperative spirit that exists between research and other APH personnel in various ongoing activities.

Descriptions of projects reported herein are concise summaries. They include information about purpose, staff, background, work done during FY 1989, and work anticipated for the next year. Different stages of development are indicated for different projects as should be expected in an ongoing R & D program. Generally these fall into identification of specific needs in an area, research and/or development planning, development of experimental materials, model review, evaluation, revisions, preparation for entering resulting new products(s) into APH's production process, and writing reports

and articles. Consultants of various types are used at different stages and on different types of projects. Experts in specific areas are used to help identify specific needs, determine specifications for new products, and review prototypical models. Other consultants are used to assist in experimental design and analyses. Still others, such as professional curriculum developers/writers, linguists, psychologists, etc., are used where needed. The R & D program at APH is designed to be pragmatically efficient.

Early Childhood





Visually Handicapped Infant/Toddler Curriculum: Development and Validation Project (continuing)

Purpose: To develop a personnel and parent training curriculum specific to blind and visually handicapped infants, toddlers, and multihandicapped children, functioning at a developmental level of birth through 2 years

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant

Background. The most recent Early Childhood Materials Needs Assessment meeting assigned a high priority to infants, including the multiply handicapped blind/visually impaired infant. The primary reason for this infant emphasis was the group's assessment of the critical nature of early intervention. It is widely acknowledged that the impact of blindness on an infant's development is documented and substantial. Numerous research studies indicate the importance of teaching parents of blind and visually handicapped children early stimulation techniques and strategies for coping with their children and their own feelings. Failure to provide a stimulating and appropriate early environment often leads to developmental lags, atrophy of the sensory systems, and to eventual developmental regression. The increasing survival of very low birthweight babies presents an array of vision related problems. Increasingly, infants with visual handicaps also have additional problems and, for these children, early intervention becomes even more important.

The need for specifically developed educational and curricular materials to assist in preventing significant developmental delays is apparent. During FY 1986 and 1987, proposals for grants were written and submitted to obtain funding for this project. None of the proposals were funded. With the growing numbers of blind and visually handicapped infants/toddlers and the advent of Public Law 99-457, the goals of this project became increasingly critical and timely.

Work during FY 1989. A third grant application was written and submitted under the federal Research in Education of the Handicapped program in November 1988. The grant proposal was titled "Infant/Toddler Curriculum Development and Validation Project." The purposes of this project, as outlined in the proposal, are (a) to develop a comprehensive curriculum concerned with early intervention for blind and visually impaired and multihandicapped infants and toddlers, birth through 2, for use with vision specialists, professionals in allied disciplines, and parents, and (b) to validate the curriculum through a series of national inservice training programs to such professionals. The project is designed to utilize expertise of both university personnel and practitioners in the development of the curriculum and the provision of inservice training. Strengths of the design are (1) that it enables the most highly qualified persons from throughout the country to participate in the areas of their expertise, and (2) that it assures national distribution of the resulting curriculum through APH, which has an interactive relationship with every state department and rehabilitation agency serving blind children and a long history of supporting personnel preparation programs in the field.

Steps in development of the curriculum are: identification of the most highly qualified persons to participate in the project, identification of critical components of existing curricula, development of detailed specifications and outlines for curricular chapters, validation of chapters through use in inservice training, and the subsequent revision and refinement of the chapters. Examples of topics to be addressed in the curriculum include Visual Training; Assessment, Intervention, and Programming of Critical Skills; Multihandicapped Visually Impaired Infants; The Impact of Visual Loss on Development; Medical Concerns; Early Orientation and Mobility Training; Methods and Materials; Working with Families; Neurodevelopmental Techniques; and so on. The validation process of inservice training will be at sites geographically distributed throughout the country. It is estimated some 500 professionals will be trained who will affect a minimum of 10 infants/toddlers each, resulting in a net impact of 5,000 children and their families.

Work planned for FY 1990. Since grant monies have not been received, the project will be reevaluated. The methods and activities for realizing project goals and objectives may need to be modified. Of the two primary goals listed below, the second goal may not be pursued if outside funding is not obtained.

1. The primary project goal is to develop a comprehensive curriculum useful to train vision specialists, professionals in allied disciplines, and parents specifically for intervening with the blind or visually handicapped child at the birth through age 2 level.
2. A secondary project goal is to provide inservice training to vision professionals and professionals in related disciplines working with blind and visually handicapped infants and toddlers, birth through age 2. This inservice training serves the project as a validation of the curriculum content.

In reviewing project options, the Educational Research and Development Committee suggested considering outside funding from a grant, in collaboration with a model demonstration program. Printing House staff will review a variety of possible directions for this curriculum development and training project.

Developing Literacy: Basic Skills, Concepts, and Early Experience  
(continuing)

Purpose: To provide a program and materials for teachers and parents of young visually handicapped children to assist them in providing, from birth, the experiences and interaction necessary to develop and interrelate skills for literacy

Project staff: Suzette Wright, Project Director and Coauthor  
Josephine Stratton, Project Coauthor  
Tom Poppe, Model and Pattern Maker

Background. Literacy, in the broad sense, refers to an individual's ability to speak, listen, read, write, and bring meaning to and get meaning from symbols. The current project focuses upon bringing meaning to and getting meaning from symbols. Development of literacy, in this sense, does not begin with a child's first exposure to school and readiness lessons; it begins at birth, as basic motor, communication, perceptual, and social skills develop and as concepts take form. Interrelationship of early skills and concepts is key to their continuing refinement and to the development of literacy. The ability to communicate, meaningfully, forms the foundation of literacy: it enables the child to bring meaning to symbols. In addition, the young child needs to develop skill in visual and hand exploration of the environment, forming a wide range of concepts and adding to the store of meaning he/she brings to symbols. It is also important the child develop skills in order to get meaning from symbols. Through exploring the environment, the child will begin to recognize naturally occurring symbols for identifying everyday objects, and will come to understand the usefulness of written symbols. Listening to and enjoying read-aloud stories is particularly important for developing the understanding that written language is a way of communicating and that it has meaning. Research shows that rich, early experiences with read-aloud books is highly correlated with a child's reading ability in later years. The need for beginning books for young children was given a high priority at a 1986 early childhood needs assessment meeting.

The current project will provide, in a print document, the framework for the development of literacy from birth and will suggest activities which may assist a visually handicapped infant or child. Storybooks, containing tactile and visual graphics appropriate for a young blind or low vision child, will be developed; suitable commercially available products will be recommended.

Work during FY 1989. The first draft of the print document for parents and teachers was completed. It consists of three parts discussing development of skills for literacy during infancy, the toddler years, and preschool years. Within each part communication, concept development, hand skills, and book experiences appropriate for the developmental period are discussed. Resource lists offer readers further sources of information. Eight braille/large type storybooks were written, illustrated, and prototypes made. Four additional stories were written and designed. In all, there are 12 books. The stories' illustrations are both tactile and visual. The tactile graphics range from



real objects on the book's pages, to thermoform replicas of real objects, to raised line drawings of real objects with familiar, simple contours (a ball, popsicle, pancake). Visually, the illustrations are simple and colorful. For the stories' text, braille and large type have been interlined. The child is not expected to read the text; it is provided for exposure as the story is read to the child or as he independently explores the book's contents. Books are constructed of a variety of materials to provide durable braille and tactile illustrations and to offer color and visual interest--extra-heavy braille paper, braillon, and colored "Polyblend" plastic with silkscreened and printed graphics. Cost of the storybooks was carefully considered. The materials and production techniques chosen represent a compromise to achieve tactile/visual interest and affordability. The parent/teacher document and tactile/visual storybooks were presented to the committee formed to advise project staff throughout the project. The 7-member committee includes teachers, a parent, teacher preparation personnel who have experience with visually handicapped infants and preschoolers, and specialists in language development and reading. The committee members were favorably impressed with the parent/teacher document and storybooks. They offered suggestions for improvement and refinement; no major revisions were suggested. Their recommendations have been implemented, and sets of storybooks are being duplicated for field evaluation.

Work planned for FY 1990. Field evaluation of the parent/teacher document and 12 storybook prototypes will be conducted at six or more sites. Review of the parent/teacher materials by additional parents of young visually handicapped children will be sought. Following analysis of the results, indicated revisions of the materials will be made. Final formatting and art for the parent/teacher document will be designed.

## Infant Skills Project (continuing)

Purpose: To develop a collection of tangible child-use materials targeted for infants and toddlers, birth-24 months, and to develop accompanying written material useful in developing critical skills in young children

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant

Background. The purpose of the recent Early Childhood Materials Needs Assessment meeting was to develop recommendations for specific early childhood educational materials research and development projects. The committee delineated and set priorities for five specific areas, with the Infant Skills project receiving a high priority rating. This high priority correlates with the emphasis at the federal level to initiate and strengthen infant/toddler programs throughout the United States under PL 99-457.

Work during FY 1989. The literature search, an important cornerstone for project development, was continued and updated. Literature surveys included areas such as child development, special education for young children, pediatric medicine, pediatric ophthalmology, family structure and development, service delivery options, physical therapy, occupational therapy, and educational programs and services. In addition, the early childhood vision annotated bibliography and agencies/services program databases, to be utilized in this project, were expanded. Commercial materials, with potential application for visually handicapped infants and toddlers, were selected, sourced, and obtained for review. In addition, preliminary specifications were developed of APH designed tangible materials for this project. A series of written materials were drafted detailing skills and activities which can be developed with the tangible educational materials. A teacher survey was also developed, querying teachers of infant visually handicapped children as to useful materials, needed educational materials, and helpful resources and references.

Work planned for FY 1990. The teacher survey data will be posted and analyzed, and used to determine final product specifications. A committee of teachers of young visually handicapped children will assist in further delineating materials specifications. All tangible materials will be sourced and collected to be used in a formative evaluation. Teachers, children, and parents to be included in the formative evaluation will be contacted. An evaluation instrument will be developed to assist in collecting evaluative data. Data from the field test will be posted and analyzed. Revisions and modifications will be made to the tangible materials in accordance with the field evaluation results.

Along with the tangible materials, a guidebook detailing suggestions, recommendations, and activities for working with visually handicapped infants will be refined and evaluated. Teachers participating in the tangible materials field test will also be requested to critique the accompanying

guidebook. This guide, developed as the Parent Early Childhood Education Series by Overbrook School for the Blind, contains a great deal of excellent information in areas as:

1. General suggestions for infants with visual impairments
2. General suggestions for the multiply handicapped young child
3. Terminology
4. Developing eating skills
5. Promoting orientation and mobility skills
6. Tactile stimulation activities
7. Sensory development activities
8. Developing vision skills
9. Selecting equipment and toys
10. Developing motor skills
11. Developing fine motor skills
12. Positioning and movement
13. Cognitive development
14. Siblings and suggestions for family life
15. Developing listening skills
16. Parent-child interactions
17. Developing language and communication
18. Developing social skills
19. Reaching and grasping
20. Bilateral coordination
21. Cause and effect
22. Object permanence
23. Siblings and suggestions for family life
24. Stereotypic mannerisms, prevention and extinction

Following the evaluations of the guidebook and tangible materials, the data will be analyzed and used as a basis for revisions and modifications. Additional field testing will be conducted as needed, based on results of the initial field evaluation.

### Preschool Learning Activities (continuing)

Purpose: To develop an instructional manual of learning activities appropriate for blind and visually handicapped preschoolers, ages 3-, 4-, and 5-years old

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant

Background. APH has begun to develop a continuum of educational materials for the 3-, 4-, 5-, and 6-year old age group. This is particularly timely, with many additional preschoolers being served through PL 99-457. This project involves a manual of varied and numerous learning activities, specifically designed to make use of common objects in the development of a continuum of sensory skills and important concepts.

Work during FY 1989. Work has progressed on the development of a manual detailing learning activities. A literature search was undertaken; relevant literature to learning patterns of young blind children was reviewed. In addition, a review was made of current preschool curricula for sighted and visually handicapped young children. An analysis was made of the concepts emphasized and the skills needed by 3-, 4-, and 5-year old children.

A local group of preschool teachers was gathered to review and enhance the learning activities already developed for the instructional manual. Activities are designed to address skills that often require a great deal of practice, such as squeezing, pouring, sorting, categorizing, classifying, sequencing, and so on. The activities make use of environmental materials such as sponges, buttons, nuts, rocks, pennies, silverware, basters, water, marbles, magnets, beads, golf tees, cotton balls, and clothespins. Special consideration is given in the manual to learning experiences beneficial to young visually handicapped children and also designed to foster integration experiences with sighted peers.

Work planned for FY 1990. The Preschool Learning Activities manual will be used by teachers working with young visually handicapped children. Following the completion of a formative evaluation, the instructional manual will be revised incorporating the recommendations of the reviewing teachers. Additional learning activities will be written and incorporated into the manual. Several sorting/ classification trays will be designed and prototypes made. These trays, along with the instructional manual, will be field-tested with visually handicapped preschoolers in the 1989-90 school year. An evaluation will be designed to obtain information from the evaluating teachers of the value, usefulness, and durability of the Preschool Learning Activities materials. These data will be compiled and will form the basis of final revisions to both the manual and the tangible component of the Preschool Learning Activities project.



Early Childhood Microcomputer Applications (continuing)

Purposes; To familiarize staff with computer software designed for young children, to assess its applicability and/or adaptability for young blind and visually handicapped children, and to develop a talking software program for young blind children

Project staff: Sheri Moore, Project Director  
Microcomputer Group

Background. The increasing trend of working with young children and computers was discussed at the Fifth Microcomputer Advisory Committee meeting. Specific to young blind children, it was determined that obtaining computer literacy early was a decided and necessary advantage. The advisory group recommended that APH staff should explore the use of computers with young totally blind children and, secondly, develop a beginning concept orientation talking software program for this specific audience.

Work during FY 1989. APH staff continued to keep abreast of the increased trends in microcomputer use with young children. Resource material and literature related to this specific topic were sourced and collected. Several pieces of early childhood software with possible application for young visually handicapped children were reviewed. Also, two specialists in early childhood vision, with microcomputer experience, participated in the Fifth and Sixth Microcomputer Advisory Committee meetings.

Work planned for FY 1990. APH staff will continue to source and review literature and software related to microcomputer applications for young children. Also, reviewing and evaluating software programs for young children and young visually handicapped children will continue. While numerous commercial producers have rapidly increased their offerings of early childhood software, very little software is appropriate for the severely visually limited child. In addition, a talking software program specifically designed for young visually handicapped children will be developed. Initially, a needs meeting will be conducted with several vision professionals using computers with young blind and visually handicapped children. This meeting will assist APH staff in determining concepts to be presented in the initial APH talking software program for early childhood learners. Following this meeting, specific software specifications will be developed. Project staff will work in tandem with the programmers from the Microcomputer Group to develop a talking software program for young children. When the talking software program is finished in a "draft" format, it will be formatively evaluated by teachers using computers with young blind and visually handicapped children.

Early Childhood References and Resources (continuing)

Purpose: To research recent literature relevant to young blind and visually handicapped children and to develop a resource list of such references and resources

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant

Background. A selected bibliography of recent early childhood vision literature was prepared for the Printing House's 1987 Annual Meeting of ex officio trustees. At the same time, several other early childhood special education resource listings were also compiled and distributed including: professional journals, curricula, general references, and assessment tools. These resource materials have continued to generate considerable interest and requests from practitioners.

Work during FY 1989. Because of the continuing demand for these resource and reference materials, the selected bibliography of early childhood literature, specific to blind and visually handicapped children, was refined and also updated. The updated bibliography contains nearly 175 references, most being written in the past 7-8 years.

In addition, a second bibliography was researched and developed entitled Developing Visual Efficiency. This selected bibliography contains some 200 references relevant to the important topic of developing visual efficiency in low vision learners. These materials continue to be available as a service, upon request, to Printing House consumers.

Parents and Visually Impaired Infants (PAVII) (continuing)

Purpose: To provide written materials useful in developing individualized intervention programs for infants and young children with visual handicaps

Project staff: Sheri Moore, Project Director, APH  
Deborah Chen, PAVII Author  
Fred Otto, Editor  
Karen Poppe, Project Assistant  
Suzette Wright, Project Assistant  
Gail Cavello, PAVII Author  
Claire Taylor Friedman, PAVII Author

Background. The PAVII materials were developed through a federally funded project of the Blind Babies Foundation in San Francisco, California. Materials developed through the 3-year project are targeted for parents, early interventionists, and special educators providing home-based services to families with visually handicapped infants. There are six print booklets comprising project materials, each with several sections.

Following discussions between the PAVII director and APH staff, APH was requested to consider publishing the project materials. All PAVII materials were subsequently reviewed and evaluated by Printing House staff. The PAVII materials were then submitted to the Educational Research and Development Committee of ex officio trustees for publication consideration. At the June 1988 meeting of the Educational Research and Development Committee, approval was given to begin the evaluation, revision, editing, and publication process of the PAVII materials.

Work during FY 1989. PAVII is composed of six major sections, each with a number of subsections. These six components are listed and briefly described as follows:

1. The Parent Assessment of Needs (PAN). An ecological inventory or interview/report form which helps parents to identify home-based goals and prioritize objectives for their infants.
2. The Parent Observation Protocol (POP). An instrument for using a video "microteaching" format in parent-training. The format encourages parent observation of self and child, as well as identifies teaching priorities and strategies for facilitating early learning experiences.
3. PAVII "How-To" Papers on Assessment. This is a series of papers for home-based assessment of infants and toddlers who are visually impaired.
4. The Art of Home Visiting. A paper which discusses roles/responsibilities and prerequisite competencies for a home visitor. It also offers practical suggestions for a home visit and issues encountered in the home visit process.



5. Getting Ready for School. A paper for parents considering preschool programs for children with visual impairments. The paper discusses the learning environment, family factors, child factors, school district factors, expert input, and educational rights.
6. Learning Together: A Socially-based Curriculum for Infants and Toddlers with Visual Impairments is a parent guide of home-based strategies for daily routines which integrate cognitive, social, communication, motor, and perceptual skills. The guide includes a brief discussion about the parent's role as "teacher," the home as a primary learning environment, and suggestions for typical routines such as meal time, bath time, bed time, play time, and going out.

All PAVII materials were extensively reviewed by four content experts. Each reviewer completed a detailed evaluation of all PAVII components as well as a general, overall evaluation. The general evaluation assessed such things as PAVII's strengths and weaknesses, potential audiences and uses of the program, the value and usefulness of the materials, specific format and organizational recommendations, appropriateness of the illustrations, and reference and resource materials that should be added to PAVII. In addition, a great deal of detailed information was obtained for each of the sections, including section strengths and weaknesses as well as suggestions for improvement.

Following the analysis of the data from the four content experts, decisions were made as to needed revisions and modifications of the PAVII materials. The entire set of PAVII materials was revised, edited and proofread; some style and format changes suggested by the reviewers were incorporated. These edited versions were mailed to the authors for approval. The approved changes were then made to each document. Arrangements were made to have the bulk of the papers formatted for production by a desktop publishing process. After each author reviewed final copy, a final proofreading for style and content was conducted.

Work planned for FY 1990. Graphic design of a cover and illustrations included in the text will be completed. A production document will be developed, detailing necessary information about PAVII. Printing House staff will work cooperatively with production personnel to assure a quality and accurate product. In addition, a final report will be written detailing overall project activities and development. Project staff will also participate in developing marketing material specific to the PAVII materials.



Classroom Calendar Project (new)

Purpose: To develop a classroom calendar with both print and braille particularly for use with preschool and primary level visually handicapped children

Project staff: Eleanor Pester, Project Director  
Tom Poppe, Model and Pattern Maker

Background. During visits to both preschool and primary classrooms for the visually handicapped in May of 1988, both calendars and activities centered around them were observed. The calendar seemed to have the potential for being a useful educational tool, but required adaptation to be meaningful for both print and braille readers. Some busy teachers did not take the time to adapt a calendar, and some of the calendars which teachers had adapted were rather unattractive. The solution seemed to be to develop a print/braille calendar for classroom use.

Work during FY 1989. A market search was conducted to see calendars available for regular classroom use, and two sample calendars were obtained. Possible methods and materials for making the calendar were explored and a list of possible symbols was compiled. A prototype was developed and a planning document and time line were written. The project was presented to an in-house committee and discussed. Following the in-house committee meeting, questionnaires were developed and sent to nine reviewers. When all nine questionnaires were returned, data were analyzed and objectives and suggested activities were compiled. Based on this information, recommendations were made for the production of (1) a classroom calendar similar to the prototype which had been developed, (2) individual monthly calendars with number print/braille stickers, and (3) minor revisions in the present APH braille calendar. A report was written and distributed to the in-house committee for comment before proceeding.

Work planned for FY 1990. Prototypes of the calendars will be produced and sent out for evaluation. Data from the evaluations will be analyzed and the calendars will be revised as needed before they are turned over to production.

Multihandicapped



### Multihandicapped Adolescent Project (continuing)

Purposes: To develop a manual of community-based learning activities designed to meet the needs of adolescent multihandicapped visually impaired students, and to develop and evaluate several tangible materials useful in fostering independent functioning in adolescent multihandicapped students

Project staff: Sheri Moore, Project Director

Background. The Multihandicapped Adolescent Project is targeted for students who have achieved basic skill levels and are involved in an educational program emphasizing self-care, independence, and life/community living skills. Written activities include age-appropriate and environmental applications stressing skills useful in a community-based living option.

Work during FY 1989. The formative evaluation process was designed and arrangements were made with cooperating teachers. The manual of community-based learning activities, stressing practical and experimental life skills, was prepared for draft form. Examples of the content areas include:

1. Grocery shopping
2. Shopping in a discount store
3. Shopping in a department store
4. Shopping for clothes
5. Accessing and using public transportation
6. Using school or personal transportation
7. Using the telephone
8. Using a laundromat
9. Eating in a fast food restaurant
10. Eating in a sit-down restaurant
11. Going to a barber shop/beautician
12. Using the library
13. Operating vending machines

All activities are being written at a basic level. They are designed to be used by staff inexperienced in working with the targeted group or paraprofessionals. An additional emphasis is on the use and development of the sensory processes in the acquisition of skills in the content areas presented. Regardless of category, all activities include environmental applications stressing the importance of developing independence, self-sufficiency, and community living/life skills.

Project staff conducted a continuing literature search to familiarize themselves with current, related material in the area of community based instruction. Journal articles, media, curriculums, and books pertaining to sensory training, age-appropriate materials, the multihandicapped adolescent, daily living skills, community living skills, self-help skills, life skills, survival skills, group home living skills, and transition were perused.



Work planned for FY 1990. The formative field evaluators have requested an extension of the material presented in the manual of community-based learning activities, because so little is available in this content area. Consideration will be given to extending activities in the manual to include a domestic skill cluster, a personal skill cluster, and a recreation/leisure cluster of learning activities. Literature in these areas will be surveyed, as well as commercial materials available in these content areas. Teachers of multihandicapped visually impaired students will participate in the writing of these additional content areas. Another group of such teachers will be selected for a field evaluation of the revised materials. Following this, necessary modifications and revisions will be made prior to the initiation of production process.

Task Oriented Inventory and Work Skills Program (continuing)

Purpose: To provide a program that will assess and include work skills activities for a process approach toward task oriented behavior with objects

Project staff: Bill Duckworth, Project Director  
Suzette Wright, Project Assistant  
Gretchen Stone, Project Author

Background. The Austin Work Skills Evaluation, from the Texas School for the Blind, was found to offer a great deal of excellent material for programming with young visually handicapped students with developmental delays as well as the moderately to severely multihandicapped student. In working with the author, however, it was found that many of the ideas could be expanded and the program could include information for various populations of visually handicapped students. The program developed to be more nearly a process of concept development for the limited student or the student with limited experiences than it was a program that led directly to vocational training. With the wide functioning range of the population needing prevocational training, it was deemed appropriate to expand the program for broader application. The program remains, however, a process of handling materials in a way leading to task-oriented behavior and to the development of work-related concepts which will serve as a basis for more specific training.

Work during FY 1989. Drafts of all sections, with the exception of the Introduction, were reviewed by the project's advisory committee. Due to the many suggestions made, major changes in format and content were undertaken. Gretchen Stone and Beth Langley, a member of the committee, worked on this revision.

Work planned for FY 1990. The revised draft of the program is expected to be completed by the end of July 1989. Following a final review of the program materials by the advisory committee, the program will be evaluated by teachers in the field using it with their students.



Low Vision





Potential for Visual Efficiency Assessment (formerly titled Assessment of Visual Potential Instrument) (continuing)

Purpose: To develop an assessment instrument useful in evaluating the potential for visual efficiency of young children with multiple impairments, in addition to a visual handicap

Project staff: Sheri Moore, Project Codirector  
M. Beth Langley, Project Author

Background. M. Beth Langley, author of the Functional Vision Inventory, has developed an instrument specifically designed to measure visual potential for visual efficiency in visually impaired multiply handicapped children. This instrument, entitled Potential for Visual Efficiency Assessment, contains seven major sections outlined as follows:

- I. Demographics
- II. Physical readiness
  - A. Medication
  - B. Time of assessment
  - C. Seizure activity during assessment
  - D. Reaction to handling
  - E. Posture and movement components
- III. Vision structure and function
  - A. Structural status
  - B. Orientation and mobility
  - C. Functional use
  - D. Physiological status
- IV. Visual behaviors
  - A. Gaze
  - B. Eye movements
  - C. Visual fields
  - D. Cortical visual impairments status
  - E. Acuity
- V. Levels of stimuli and responses
  - A. Stimuli processed
  - B. Response patterns
- VI. Visual perception
- VII. Summary and impressions
  - A. Current level of visual functioning
  - B. Visual variables
  - C. Skills to be developed and/or refined

Work during FY 1989. An array of literature in several disciplines was sourced, surveyed, and integrated into the Potential for Visual Efficiency Assessment. Journal articles were read and incorporated in disciplines including developmental medicine, child neurology, ophthalmology, pediatrics, brain research, pediatric ophthalmology, physiological psychology, psychology, low vision, developmental disabilities, and child development. In addition, a number of refinements were made to the instrument, such as additional evaluation sections and a more convenient format for the evaluator.

Work planned for FY 1990. A schedule and time line will be developed cooperatively with Printing House staff and Beth Langley. This schedule will detail remaining project activities. The Potential Assessment of Visual Efficiency instrument will be field-tested by a number of professionals in a variety of disciplines related to multihandicapped visually impaired learners. Revisions will be made to the instrument following the field evaluation procedure. Tangible materials may be added, depending on results of the field evaluation, and the needs of vision professionals evaluating the instrument.

Braille





Read Again: A Braille Program for Adventitiously Blinded Print Readers  
(formerly entitled Read Again: A Program for Adventitiously [Recently]  
Blinded Persons) (continuing)

Purpose: To develop a set of materials designed to teach braille to persons who lose their vision after initially learning to read print

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Fred Otto, Assistant Editor  
Karen Poppe, Project Assistant

Background. A complete set of materials was designed to teach braille reading to persons who lose their vision after initially learning to read print. This set of materials was reviewed by the project's consulting committee. Pending revisions, the program was approved for production by APH's Publications Committee. Revisions of two of the beginning levels introducing braille letters, numbers, and basic punctuation were made and the levels were again reviewed by the committee. Following this meeting, these levels were once again revised to reflect the committee's suggestions, completing work on the part of the program dealing with Grade 1 Braille. Then the part of the program dealing with Grade 2 Braille was revised and new reading applications were selected, copyright permissions were secured, and some readiness materials of special relevance to the target population were written. The entire program was copyedited and content problems were cited. The research staff met together, reviewed the entire program, and made decisions about the problems that had been cited. Following this meeting, further copyediting was done based on decisions the group had made. Additional practice materials available from APH were referenced. Detailed specifications were written for braille and one copy was marked up for recording. Levels A and B were marked up for typesetting.

Early in the project a survey of 200 adventitiously blind people learning braille was made to provide information for the development of the materials. An article describing the survey was written, submitted for publication, and rejected. A revised article on the survey of the adventitiously blind was submitted to another journal for publication consideration.

Work during FY 1989. Level A was brailled on plates and the decision was made to wait until the typesetting was completed before continuing with the braille and the recording. All levels of Read Again were marked up for typesetting by Eddy Jo Bradley. The research staff worked with the typesetter to produce satisfactory galleys. The galleys for all the levels were dummied up, artwork was added, and front matter was completed. Proof copies of the entire program were returned from the typesetters and checked and double checked by the research staff. Final revisions were made. All of this preparation for production took longer than has been anticipated.

The article on the survey of the adventitiously blind was returned once again with suggestions for additions and a request that the revised article be resubmitted for publication consideration. The article was revised and resubmitted.

Some progress was made on an article on the sequencing of the presentation of the braille code for adults. This included developing a tentative outline and a coding system suitable for publication and updating and adding to the information which had already been compiled. Because of the time spent on revising the article on the adventitiously blind survey, work on this article was not completed.

Work planned for FY 1990. It is anticipated that as braille and recording for this program get into full swing, the research staff will be working closely with the production staff. The final report for the project and the article on the sequencing of the presentation of the braille code for adults will be written.

Braille Language Program (continuing)

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Karen Poppe, Research Assistant  
Eddy Jo Bradley, Directing Editor  
Eric Hamp, Linguist

Background. This project is partially funded under a grant awarded to the APH by the Federal Research in Education of the Handicapped Program's Field Initiated Research competition which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, US Department of Education. The resulting product has been approved for production.

Work began on the project in January 1984. Information on achievement in language, spelling, and word study skills was obtained through administration of a special braille edition of the Stanford Achievement Test, Intermediate I, Form E by teachers to 57 blind 4th and 5th grade students to identify specific problems blind students have. Analyses were made of current spelling and English textbooks and of Patterns: The Primary Braille Reading Program. This information was used to develop the program.

The program will consist of four levels, Levels A, B, C, and D. The first two levels of the program, Levels A and B, were drafted, reviewed, revised, and sent to pilot test sites for evaluation. The consulting committee met and reviewed the materials on each level. Further revisions were made based on these evaluations. Then the materials were placed with over 50 students and approximately 20 teachers at field test sites across the country. Annual visits were made to the sites to explain the field evaluation procedures, check on progress, and observe the materials in use. Criterion referenced tests were administered as the children completed each level. Test results were sent to APH for scoring and analysis. A similar procedure will be followed with each of the succeeding levels.

Work during FY 1989. Level C materials were prepared and sent to field test sites for use with students as they were ready for them. Field test sites were visited. Level D materials were planned and drafted.

Work planned for FY 1990. Field testing of the materials will continue. Level D materials will be prepared for field testing. Materials will be sent to the field test sites as students are ready. Final revisions of the Level A materials based on the field evaluations will be made in preparation for production. Federal support for the project will cease December 31, 1989, at the end of the project's 5th year.



Grade 2 Braille Cards (continuing)

Purpose: To develop a set of cards with Grade 2 Braille units on one side and the Grade 2 Braille equivalent on the other side to be used with adventitiously blinded teenagers and adults who are learning braille or with younger braille readers who have been introduced to braille but need identification or spelling practice

Project staff: Eleanor Pester, Project Director

Background. This product was first conceived in 1987 when plans were underway to expand the Dolch Word Cards. Teachers of braille from both schools and rehabilitation centers who were questioned felt that such cards would be useful for their students. Grade 2 Braille Cards were approved for production at the annual meeting in October of 1987. No further research on this product was anticipated since the braille units themselves were set and a similar format to that for the Expanded Dolch Word Cards would be used. Work on this product was expected to begin soon after work on the Expanded Dolch Word Cards was completed.

Work during FY 1989. When specifications for production of the Grade 2 Braille Cards were being written, questions arose concerning what to include to make this product the most useful. It seemed best to get input from braille teachers to determine the final specifications for this product. A brief questionnaire was developed and sent to nine braille teachers with experience working with the target population. Information from the seven completed questionnaires was used to write the final specifications for this product.

Work planned for FY 1990. This project is complete. Research staff will oversee the first production run of the product.

## Braille Spacing and Size for Beginning Adult Readers (continuing)

Purpose: To determine the optimum spacing and size for initial presentation of braille to beginning adult readers

Project staff: Eleanor Pester, Project Director  
Karen Poppe, Project Assistant  
Joe Petrosko, Design and Evaluation Specialist

Background. Although little is known about the effects of spacing and size on the introduction of braille to adults, indications are that both play important roles in braille code recognition. Nolan and Kederis (1969) found that recognition of characters by 36 skilled braille readers in grades 4 through 12 was significantly influenced by the distance between dots and their location within the cell. Books for young beginning braille readers are generally double-spaced (interlined) in accordance with the standards for braille books. Milback (1954) and Hoffman and Cook (1970) suggest double-spacing both between lines and between words to aid young braille readers in discrimination. In a study done by Newman (1984) with 80 sighted male subjects, learning was facilitated by using large braille cells. Both braillewriters and slates and styluses are available for producing enlarged braille either with an enlarged dot or with a standard sized dot in an enlarged matrix. At least one braille program for adults, Braille Series, 1960, provides enlarged braille practice materials in three sizes--very much enlarged, moderately enlarged, and slightly enlarged braille. Some rehabilitation counselors feel they have better results when braille is presented initially to adults with more than the usual space around the braille characters, and some feel that enlarged braille is especially useful for teaching braille to people with decreased tactual perception. Others feel enlarged braille should not be used. Research is needed to determine optimum spacing and size for initial presentation of braille to beginning blind adult readers.

A study was designed which compared the performance of 40 blind adults who knew little or no braille on a randomly ordered series of tasks which presented braille characters in standard and enlarged braille with one, two, and three spaces between characters and with one or two line-skips between braille lines. The data were analyzed and results showed that regardless of the size of braille used, the space between characters, or the skips between lines, subjects got about the same number of items correct. Enlarged braille took subjects a longer time to read than standard size braille. The 11 diabetic subjects performed about the same as the nondiabetics, both on number of items correct and speed of performance. In contrast, the 6 subjects who were more than 70-years old got significantly fewer items correct than younger persons. These results were applied to Read Again which will be produced in standard braille only. Additional analyses of the data were done to clarify some points mentioned in the study.

Work during FY 1989. The final report was written. An article will be taken from this report and submitted for publication.

Braille Line Length Study (continuing)

Purpose: To compare reading speed and accuracy under three conditions--(1) paper with 40 cell lines, (2) paper with 20 cell lines, and (3) VersaBraille with 20 cell lines

Project staff: Eleanor Pester, Project Director  
Joe Petrosko, Design and Evaluation Specialist  
Karen Poppe, Project Assistant

Background. With the advent of paperless braille devices such as VersaBraille, the question of the optimum length for a braille display has arisen. At the present time, cost is a prohibiting factor, limiting the length of the display line. However, if a longer line was found to be sufficiently superior to the 20 cell line in general use, the increased cost might be justified. As APH plans for a braille display with its APH PocketBraille, and as technology and cost become less limiting factors, line length becomes an important question. Surprisingly, to date a review of the literature has turned up no research on this question.

Work during FY 1989. A study comparing reading speed and accuracy of experienced adult VersaBraille users under the three conditions described in the purpose has been designed. Three passages of approximately 500 words each and of comparable difficulty and interest have been selected for this rate study. The Cloze Technique, how it relates to visually handicapped persons using braille, and the variation used in the reading rate test where subjects are asked to identify words that do not belong as they read were investigated and applied to the test material for a broad check of comprehension.

Before the test materials could be prepared, it was necessary to conduct a survey to determine whether the participants use the older VersaBrailles which use cassettes or the newer ones which use disks and whether participants are familiar with the IRS code or with the newer BANA code. Telesensory Systems, Inc. has furnished a list of VersaBraille users who are being surveyed and from which the subjects for this study will be selected.

Work planned for FY 1990. Data from the survey will be analyzed and test materials will be prepared. Arrangements will be made for testing, and data will be collected and analyzed. A final report and an article will be written.



Linguist Analysis of American Literary Braille, Grade 2 (continuing)

Purpose: To conduct a thorough and systematic linguist analysis of American Literary Braille, Grade 2, which will incorporate the new braille terms developed for Patterns: The Primary Braille Reading Program

Project staff: Hilda Caton, Project Director  
Eric Hamp, Linguist  
Karen Poppe, Project Assistant  
John Siems, Data Analyst and Computer Programmer, APH

Background. At the present time, no systematic analysis of American Literary Braille has been conducted. The British have completed a major contraction study of their system which includes frequency of occurrence of contractions in written text. That study, however, did not consider a grouping of braille configurations (contractions) which was different from the grouping now in use. The study proposed for American Literary Braille would use the new terms (groupings) used in the braille reading and language programs developed at APH for an analysis somewhat similar to the British study. This study would include the following steps:

1. Selection of appropriate text materials for the analysis
2. Marking (or bracketing) of the braille configurations defined in Patterns: The Primary Braille Reading Program
3. Counts of the frequency and order of occurrence of those elements in the text materials
4. Revision of the order and groupings of braille rules in the publication English Braille: American Edition with an emphasis on more effective orders and groups for teaching purposes
5. Publication of various types of materials to assist in the teaching and learning of braille

Work during FY 1989. The text materials used for the analysis were chosen. They will consist of the corpus which forms the basis of the publication, Computational Analysis of Present-Day American English (Kucera, H., & Francis, W. N., 1967), generally known as the "Brown Corpus." This publication contains 1,014 words and consists of 500 samples each of about 2,000 words, taken from contemporary publications in American English. In addition to the "Brown Corpus," selections from current issues of the Readers Digest, which have been translated into braille, will be used.

The Brown Corpus Computer tape has been obtained and a printout of a current set of articles from the Readers Digest (from the APH translation program). The following marking (bracketing) and counting of braille units has been done:

1. A line by line marking and counting of all braille units
2. A marking and counting of all contractions, composition signs, punctuation, and numbers (alphabetic and numeric)



3. A marking and counting of all whole word signs which are sometimes contracted, but are not contracted under specified circumstances (i.e., they occur at the end of a line, near punctuation, etc.).

Work planned for FY 1990. The marking and counting of various types of occurrences of the braille units will continue (i.e., the frequency with which one braille unit precedes another). An analysis will be made of the counting of braille units which was completed in 1989. A report will be written describing the completed part of the analysis and its implications for the braille code and the teaching and learning of the code.

Braille Writing Program (new)

Purpose: To develop an instructional braille writing program with both slate and stylus and braillewriter components

Project staff: Hilda Caton, Project Codirector  
Eleanor Pester, Project Codirector  
Eddy Jo Bradley, Materials Developer  
Betty Wommack, Materials Developer

Background. To provide a truly comprehensive program in braille instruction, it is necessary to teach braille writing as well as reading. With no formal programs available, braille writing instruction was dependent on the individual teacher. A survey done by Lowenfeld, Abel, and Hatlen (1969) reported that braille writing was usually introduced to children at the same time as braille reading and that the braillewriter was usually used to teach braille writing. No other research is available on braille writing instruction. However, cases cited in current literature indicate that instruction for children in the use of the slate and stylus has been neglected.

From the time when planning for Patterns: The Primary Braille Reading Program and Read Again: A Braille Program for Adventitiously Blinded Print Readers began, the need for more formal braille writing instruction was recognized. An introduction to the use of the braillewriter was written as part of the Braille Language Program, and during the past few years several slate and stylus programs have been developed. A review of these programs showed that the program by Betty Wommack most closely corresponds to the philosophy of slate and stylus instruction which has been developed at APH. This slate and stylus program could be used in conjunction with the braillewriter material already written to produce a comprehensive braille writing program. Betty Wommack has been contacted and is willing to work with APH on this project.

Work planned for FY 1990. The people involved in this project will meet to determine the specifications. A draft copy of the program will be developed and copies will be prepared for review. The data from the reviews will be analyzed and revisions made as necessary before turning it over to production.

New Programmed Instruction in Braille (new)

Purpose: To review a new edition of Programmed Instruction in Braille (Ashcroft & Henderson, 1963) and prepare it for production by the American Printing House for the Blind

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
LaRhea Sanford, Project Coauthor  
Sam Ashcroft, Project Coauthor

Background. The original publication of Programmed Instruction in Braille (Ashcroft & Henderson, 1963) was widely used in teacher preparation programs throughout the United States. The publication of the book was discontinued because the publisher went out of business. Since then, there has not been a textbook which was totally adequate for the instruction of future teachers (or others) in learning the literary braille code. However, Programmed Instruction in Braille has now been revised and is being reviewed and considered for publication by the American Printing House for the Blind.

Work during FY 1989. Work during this period consisted of the updating and rewriting of the book by Samuel Ashcroft and LaRhea Sanford. A meeting was held at the American Printing House for the Blind to discuss the procedures and considerations for publication by APH.

Work planned for FY 1990. During this period, the revised version of New Programmed Instruction in Braille will be sent out for review by persons in the field who are knowledgeable about the literary braille code and about instructing others in learning it. The project staff at the American Printing House for the Blind will also review it. Following this, the reviews will be summarized and decisions regarding production by APH will be made.

## Educational Measures





Brigance Diagnostic Inventory of Early Development (yellow) (continuing)

Purpose: To provide a tactile supplement to this Inventory for blind children ages infancy through 7

Project staff: Bill Duckworth, Project Director  
Josephine Stratton, Research Intern (formerly)

Background. This Inventory is being revised by its publisher. A new edition is expected in 1989. The publisher has said most of the competencies will remain in the same order with much of the material remaining intact.

The adaptation of format has been done on the current edition. All activities have been assigned a label as to what steps the teacher will take in assessment such as using the supplement, using the print edition with modification, etc. One section, General Knowledge and Comprehension, was completed and evaluated to determine if the format was appropriate. However, a decision was made to put the project on hold until the new edition is released in order that the supplement from APH be for use with the newer edition. The Inventory was approved for production by APH's Publications Committee.

Work during FY 1989. Waiting for the revision to take place, Curriculum Associates notified APH that the plans to revise this inventory have been delayed.

Work planned for FY 1990. Adaptation will be completed when the revision is published.

Computer Administration of Academic Measures (continuing)

Purpose: To investigate the possibilities of using microcomputers to administer academic measures

Project staff: Bill Duckworth, Project Director

Background. For ease of administration, scoring, and record keeping, it seems quite plausible that some types of academic tests could be placed on computer disks for use by students who use braille and large type. The braille user would use the voice synthesizer along with braille and graphics where needed. Problems of doing this for the large type user have yet to be identified other than the need to change the format for placement of large type on the screen. Tests presently offered on computer were examined. Most were found to be not academic, but personality, occupational preference, etc.

Testwriter from Micro Media Publishing was found to have all the components that were felt to be important in administering an academic test on a computer. Test items from the Stanford Achievement Series were placed on the disk. The administration allowed a review of a question but changing mode was complicated. It also allowed storage of the students incorrect answers on the disk. Many markings which are used in pencil and paper tests and in braille tests had to be changed to be read on the screen. This is especially true for large type users. Several adults took the test and it was found that the test was a greater indicator of the person's expertise with a computer/synthesizer than it was of the knowledge of the material being tested.

Work during FY 1989. No further activity has taken place on this project.

Work planned for FY 1990. One subtest of the Stanford Achievement Series (8) will be tried with several high school students where computers are used in a manner to verify familiarity. If the speech component does not give problems with these students, then a study will be developed that will compare the results of a limited number of students taking one form of the subtest on the computer and the other form with paper and pencil.

Stanford Achievement Test, Form J of Series 8 (continuing)

Purpose: To adapt into braille and large type one form of the latest edition of the nation's most widely used achievement series

Project staff: Bill Duckworth, Project Director

Background. Continued contact with The Psychological Corporation, the publisher of the Stanford Achievement Series, obtained for APH the opportunity to be involved in the planning stages of the Stanford Achievement Test, Series 8. The series looks promising in that APH has had input into the item selection. Additionally, The Psychological Corporation has volunteered to renorm any subtest from which it is necessary to omit items in the braille edition. This edition is unique in that each level of the test is for one grade level only. The levels to be modified begin with 2.5 to 3.5. This presents APH with the possibility of offering only one form of the test. Psychological Corporation sent APH the item pool for the Stanford Achievement Test, Series 8. All test items that would pose a problem for the braille edition were flagged. Whenever possible, The Psychological Corporation avoided using these items in the final item selection for the series. This process seems to have been effective. In the Primary 2 level of Form J, only one subtest (Environment) had to be dropped and 6 questions from another of the subtests. This is in comparison to two entire subtests and 12 questions dropped from the braille edition of this level in Series 7. Form J (Series 8) was approved for production by APH's Educational Research and Development Committee.

Work during FY 1989. Ten levels of Form J of the Stanford, Series 8, were adapted into braille with eight accompanying sets of Directions for Administering. Input for the braille tests has been completed. The Psychological Corporation will furnish film for use in printing the large type tests in 18-point type. This has not been done and the manuals cannot be completed until the tests are formatted.

Work planned for FY 1990. Final drafts for the Directions for Administering the Large Type editions will be completed and submitted for publication by APH. A report describing the adaptation of this series will be prepared.





Microcomputer Applications  
Process and Information Dissemination



Sixth Microcomputer Advisory Committee Meeting (series)

- Purpose: (1) To identify and prioritize needs for educational materials to support use of microcomputers  
(2) To discuss and make recommendations regarding important technology-related considerations

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Project Assistant

Background. An advisory group was formed in 1984 to provide specific information and guidance on a continuing basis in the area of technological needs and applications. Five microcomputer needs meetings were held with the advisory group at APH. They were in August 1984, March 1985, October 1985, September 1986, and September 1987.

Work during FY 1989. The Sixth Microcomputer Advisory Meeting was held September 19-20, 1988. The greatest needs (not in order of priorities) identified at this meeting were:

Apple(R) products

1. Develop Talking Literacy Kit (TALK) for Apple II computers.
2. Develop Screen Door for Apple II computers.
3. Make Teacher's Pet available.
4. Adapt MECC's Food Facts.
5. Adapt MECC's Elementary Vol. 5 - Prefixes.
6. Adapt MECC's Social Studies Vol. 1.
7. Adapt KIDS CAN! TYPED (Talking Typer).
8. Make all 33 selected SEI programs available.
9. Continue to adapt MECC software and/or any other software deemed important for visually handicapped persons. (Accept recommendations from the field regarding specific selections to adapt.)
10. Develop materials to introduce students and teachers to telecommunications.
11. Develop a talking software program for young blind children that would be usable by both totally blind and partially sighted students.
12. Adapt Number Cruncher (APH Scientific Calculator: for Apple II Computers).
13. Adapt Apple's DOS User's Disk (Talking Utilities for DOS 3.3).
14. Write a supplement of 10-15 simple programs that can be used by visually handicapped persons in a computer literacy class. (This recommendation replaces the recommendation made by the Fifth Microcomputer Advisory Committee to make an adapted version of Sunburst's BASIC programming series available.)
15. Make the Apple II GS Owner's Guide available on 3 1/2" disk.
16. Make the Appleworks Tutorial (manual) available on disk.
17. Make the Appleworks Reference Manual available on disk.



18. Enable software for the Apple IIGS:
  - (a) Write a TEXTALKER GS program; and
  - (b) Develop a SCREEN ENLARGEMENT program for the GS.
19. Continue with the development of the APH PocketBraille:
  - (a) miniaturization;
  - (b) file structure;
  - (c) editor;
  - (d) reorganize the manual;
  - (e) pursue a braille display;
  - (f) pursue software enhancements (e.g., calculator/stopwatch).

IBM(R) products

1. Develop Speaqualizer II for PS/2 series.
2. Develop Screen Door for IBM.
3. Continue with the development of the APH PocketBraille.

The Microcomputer Advisory Committee was extremely complimentary of the work that had been done; the products that have been adapted and developed, the services that have been provided, the surveys that have been conducted, etc. The committee members could not emphasize enough, however, the need for more products in this area and a timely delivery of the materials.

Work planned for FY 1990. A seventh meeting of the Microcomputer Advisory Committee will be conducted in September of 1989 to review progress, share information, discuss current priorities, project future activities, and reprioritize the needs in this area. A special meeting of early childhood needs with regard to computer use will also be conducted in the fall of 1989 since this is a new area of endeavor.

Survey of Products Being Used and Products in Need of Development for Legally Blind Persons Using Microcomputers (continuing)

Purpose: To determine the greatest needs of the field and set priorities appropriately by gathering information on the current "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons

Project staff: Debbie Willis, Project Director  
Cathy Talbott, Project Assistant

Background. When APH became interested in developing microcomputer related products in the summer of 1983, it was necessary to determine the greatest needs of the field and set priorities appropriately. Information regarding the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons was gathered during the fall and winter of that year. Recognizing, however, that this is a rapidly changing field, a second survey was conducted in the winter and spring of 1986. These two surveys provided valuable information for planning and decision-making purposes.

Work during FY 1989. In order to keep current, a third survey was planned. The October '88 issue of Electronic Learning, however, included the results of "Educational Computing In America: 8th Annual Survey of the States, 1988." Electronic Learning had surveyed the states in six educational technology areas: computer literacy; teacher certification and training; trends, issues, and concerns; state-wide technology efforts; state profile; and equipment, including hardware/software policies, and additional technology. The survey also revealed that 75% of the states intended to begin new technology-related programs in 1988-89. Heading the list were programs related to distance learning projects, and projects involving such emerging technologies as CD-ROM, videodisc, and laserdisc. This survey and other literature provided the direction needed. It was decided that a third survey was not necessary at this time, and if general information like this continues to be available, APH will only need to concern itself with specific questions regarding the visually handicapped population.

Work planned for FY 1990. Trends and changes in the computer industry and in education will be monitored through reviewing literature and attending conferences. Another survey is not planned at this time. Brief surveys on specific questions will be proposed as the need arises.

Observation and Information Dissemination (continuing)

Purpose: To gain insight into user problems by observing students at the computer and to disseminate information on current uses of technological aids through workshops, presentations, and other means

Project staff: Microcomputer Group

Background. The Fourth Microcomputer Advisory Committee recommended the microcomputer group help disseminate information about relevant technology to the field. Additionally, the meeting of the interim committee in May 1985 resulted in a strong recommendation that the microcomputer group observe students using APH computer products. To this end, the microcomputer group conducted the summer workshops in June 1986, presented microcomputer materials at several conferences, and observed students on a weekly basis at the Kentucky School for the Blind.

Work during FY 1989. The microcomputer group continued presenting and demonstrating APH microcomputer materials at relevant conferences. In addition, at least one member of the group observed, on a weekly basis, students of all ages using a variety of software. Interested users that visited APH also receive detailed product demonstrations upon request.

Furthermore, an annotated bibliography on technology-related topics from 1980-88 for visually handicapped persons was compiled. The bibliography was made available free of charge on 5 1/4" disks formatted for Apple II computers. APH's text file reading program was included on the disk so that the information could be accessed quickly and easily.

Work planned for FY 1990. The microcomputer group plans to continue with presentations and demonstrations of APH's computer-related products and the observation of computer users of all ages whenever possible. The bibliography will be updated and made available again during this fiscal year.

Product Evaluation (continuing)

Purpose: To evaluate user satisfaction with APH microcomputer products, to monitor and improve project planning and management, and to continue the identification of users of APH microcomputer materials

Project staff: Debbie Willis, Project Director  
Cathy Talbott, Project Assistant  
Karen Poppe, Project Assistant

Background. From the first software product published by APH, all microcomputer materials have included a self-addressed, postage-paid "User Survey Card" which asked for information which would identify the consumer, product, setting in which the product is used, strong and weak points of the product, suggestions for improvement, current equipment accessible to the user, number of users and their age/grade range, and additional comments. As an assessment instrument for evaluation, these cards provide a valuable source of information which aid in the decision-making process of the staff involved with improving existing products, determining future needs and projects, and monitoring trends in these categories. These cards also serve as a vehicle for identifying users of APH microcomputer material which is useful in finding reviewers of products and potential participants in microcomputer advisory meetings. Results of the entered data were reported at the Fifth Microcomputer Advisory Committee Meeting. Consumers' names and addresses have been entered in a separate database to receive copies of the Micro Materials Update.

Work during FY 1989. Complete information from all the user survey cards was entered into a database. Results of the entered data were compiled and reported at the Sixth Microcomputer Advisory Committee Meeting. Names and addresses of new consumers continued to be entered in the database of those who are to receive copies of the Micro Materials Update.

The User Survey Card was slightly changed. Since it is in print only, a braille notice regarding the User Survey and Warranty cards was developed to be inserted in future microcomputer products.

Work planned for FY 1990. The information from the User Survey Cards will continue to be entered into a database. The data will be analyzed periodically to study trends, revise current products, and assist in future planning. Names and addresses of new consumers will continue to be entered in the database used as a mailing list for the Micro Materials Update.



Information Dissemination: Micro Materials Update--newsletter (continuing)

Purpose: To provide a description of completed, ongoing, and planned APH microcomputer materials development projects to serve as a (a) newsletter for professionals in the field, (b) convenient means of responding to requests for more information, and (c) handout to distribute at appropriate presentations/workshops/exhibits

Project staff: Microcomputer Group

Background. The first Micro Materials Update was generated specifically for the purpose of serving as a handout for a teacher inservice presentation made by APH staff in November 1985. The same year the Microcomputer Advisory Committee recommended adding a column that would include information, in this field, that was being pursued outside of APH. The title of the column became known as "News, Views, and Muse."

Responsibility for the Update was divided between research and marketing staffs. Research was responsible for the content of the newsletter, maintaining the database of addresses, and for providing an address label printout for mailing. The newsletter was made available in braille and print forms.

The mailing list continues to grow, giving APH valuable resource of persons who are buying and using APH software and related products. In its latest issue, Summer 1989, 4,400 copies were necessary to keep pace with request for more information.

Work during FY 1989. The Micro Materials Update was updated and disseminated in print and braille twice during FY 1989. Both research and marketing contributed articles. The database of readers continued to be maintained. The Update was provided as a handout at numerous presentations, workshops, and exhibits this fiscal year. The Update also served as a quick and valuable response to phone calls and letters regarding APH's computer products.

Work planned for FY 1990. Current plans call for updating and disseminating the newsletter semiannually and maintaining the database.

Microcomputer Applications  
Products



APH PocketBraille (continuing)

Purpose: To develop a portable note-taking device

Project staff: Larry Skutchan, Project Director  
Jeff Wheatley, Programmer  
Fred Otto, Project Assistant  
Jim Robinson, Manufacturing Specialist

Background. The Kentucky Department for the Blind developed the PocketBraille and PortaBraille. Each is a complete portable note-taking system with braille keyboard, parallel and serial ports, and a speech synthesizer. The PortaBraille additionally contains a braille display. Each contains firmware that makes writing and editing possible. With the approval of the Educational Research and Development Committee, APH began designing a version of this system. It is called the APH Pocketbraille. The APH PocketBraille was first marketed in June 1988.

Work during FY 1989. Enhancements to the firmware were installed to provide bug fixes, improved speech quality and responsiveness, and to compensate for differences in a new microprocessor that was substituted for the original version which is no longer available in the United States. Preliminary design specifications were developed to provide the PocketBraille with more simple editing functions and a file management system. The anticipated code changes for the new version of the Screen Door for the Apple will be postponed until FY 1990 due to delays in the manufacturing of the board. Likewise, code installation to support the Screen Door for the IBM has been postponed until further development of the Apple version. The manual has been rewritten to provide a more tutorial-like style that presents information a little at a time. It moves less used topics to later in the book.

Work planned for 1990: The enhancements to both versions of the Screen Door should be completed in FY 1990. The work begun on the editor and file system should also be completed. The PocketBraille's new manual will be reviewed, edited, and turned over to production.



APH Scientific Calculator: for the Apple II Computer (formerly entitled Number Cruncher (continuing) .

Purpose: To produce a talking calculator program

Project staff: Larry Skutchan, Systems Programmer

Background. Members of both the Third and Fourth Microcomputer Advisory Committee Meetings noted the need for a sophisticated, inexpensive calculator program. Such a program was discovered on the CompuServe network, the author was contacted, and permission to adapt the program was obtained. It was called Number Cruncher. Production approval for this product has been obtained.

Work during FY 1989. Final program changes were implemented, and problems associated with the name of the product were resolved by renaming it APH Scientific Calculator: for the Apple II Computer. The package was turned over to production.

Work planned for FY 1990. The Number Cruncher project is complete. Future enhancements will be dictated by responses from the field.

BASIC Programming (new)--replaces Sunburst's Meet the Computer--Beginning Topics and Meet the Computer--Intermediate BASIC (discontinued)

Purpose: To adapt these sets of materials for use by visually handicapped students or clients who need to learn BASIC programming

Project staff: Debbie Willis, Project Director  
Cathy Talbott, Project Assistant  
Rob Meredith, Programmer

Background. Members of the Fourth Microcomputer Advisory Committee Meeting assigned a high priority status to reviewing Sunburst's BASIC programming series for possible adaptation for use by visually handicapped persons. These include Meet the Computer--Beginning Topics and Meet the Computer--Intermediate BASIC. Both levels of the series were reviewed and found to be an excellent set of materials. Adapting these sets of materials was given high priority at the Fifth Microcomputer Advisory Committee Meeting. Because of the workload, however, it was decided to delay work on this project until the next fiscal year.

Work during FY 1989. Members of the Sixth Microcomputer Advisory Committee decided that what was actually needed was a supplement of 10-15 simple generic programs to accompany an introduction to programming class. This supplement should include programs that have some meaning for visually handicapped learners. This project on BASIC programming was substituted for the adaptation of Sunburst's programming series.

In preparing to design this revised product, a textbook and software program analysis was conducted to determine a procedure for teaching BASIC programming. In this analysis, six textbooks and three programs were analyzed and the main concepts taught were listed. This list was then given to a few teachers for review. The teachers were asked to number the concepts in the order in which they would recommend teaching them. The results were combined and suggestions were documented for a BASIC programming disk.

Work planned for FY 1990. A plan of what concepts should be covered and the order of presentation will be specified. It will also be determined what each of the 10-15 programs should do. The supplement and the programs will be written. These materials will be reviewed by in-house staff, revised, and then sent out for evaluation. After necessary modifications and a final in-house review have been done, the product will be turned over to production.

Manuals (continuing)

Purpose: To provide manuals in braille, large type, recorded, or disk form to support use of commonly used microcomputer equipment and programs

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Fourth Microcomputer Advisory Committee Meeting, it was recommended that APH continue to provide manuals deemed important in a medium usable by visually handicapped persons. In April 1986, Apple offered to supply APH the ASCII text files of Apple manuals for editing and dissemination by APH. The significance of this gesture resides in the fact that an individual possessing the ASCII text file of any work has the ability to output that information in hardcopy regular print, large print, or braille; refreshable braille; or synthetic speech.

Production approval was obtained for the Apple IIGS Owner's Guide and its ASCII text files were received from Apple. An edited version of the disk edition, with additional changes specified by Apple's editors, was approved by Apple. Although the idea of a manual reading program did not receive top priority at the Fifth Microcomputer Advisory Committee Meeting, it was decided to write a beginning level program for ease of reading text provided on disks.

Work during FY 1989. Changes, as specified by Apple, were included in the disk version of the Apple IIGS Owner's Guide. The text files of the IIGS Owner's Guide were broken down by topics into small files and grouped in subdirectories for easy access by the manual reading program. The disk also contains the complete manual in one large file for those who wish to print it out in its entirety and an introduction in braille and large type. The disk version with its hardcopy introduction, was reviewed by in-house staff.

After lengthy consideration of the implications of allowing manuals on disk to be provided, Apple's Legal Department formalized their Software Licensing Agreement for disk manuals and granted APH permission to publish Apple manuals on disk. APH will have first choice of which of Apple's manuals to publish on disk.

Apple sent text files of the Apple IIc+ Owner's Guide with permission to produce it on disks as well. APH also received permission from Addison-Wesley to produce Applesoft BASIC Programmer's Reference, BASIC Programming with ProDOS, and the Apple IIe Technical Reference on disk. Since Apple no longer holds the rights to APPLEWORKS, permission to produce the Appleworks Reference Manual and Appleworks Tutorial on disks is being sought from Claris Corporation.

APH personnel met with an IBM representative to discuss the need for disk versions of IBM manuals. It appears that IBM is interested in working in that direction. IBM manuals can currently be accessed through an on-line

communications system called "Book Manager." The user, however, pays a fee comparable to the cost of the printed manual plus the on-line cost.

Work planned for FY 1990. After the final review of the disk version of the Apple IIGS Owner's Guide, the ASCII text edition of the manual with an introduction provided in braille and large type will be turned over to production. Assuming permission is granted by Claris Corporation, top priority will then be to edit and produce the Appleworks Reference Manual and Appleworks Tutorial in the same manner as the Apple IIGS Owner's Guide. The other manuals APH has permission to provide on disk will be discussed and prioritized at the next Microcomputer Advisory Committee Meeting in the Fall. Other manuals will be considered for production as demand warrants. The release of talking software for the Macintosh makes Macintosh manuals worth consideration.



MECC Software (continuing)

Purpose: To adapt widely used educational software distributed by the Minnesota Educational Computing Corporation (MECC)

Project staff: Debbie Willis, Project Director  
Jeff Wheatley, Programmer  
Larry Skutchan, Systems Programmer  
Cathy Talbott, Project Assistant

Background. Participants in the Second, Third, Fourth, Fifth, and Sixth Microcomputer Advisory Committee Meetings and members of the Educational Research and Development Committee at APH's 1986 Interim Meeting and 1988 Annual Meeting assigned high-priority status to the development of speech-adapted software from MECC. This challenge is particularly noteworthy because MECC materials are developed by educators and include a vast collection of titles already available to thousands of school systems nationwide.

General approval for production of speech accessible adaptations of the MECC software was granted with the following priorities: 1. mathematics, 2. science and simple logic, and 3. English, social studies, and writing.

After completing the talking version of Elementary Volume 1--Mathematics, permission was sought and received from MECC to modify three additional selections. They are Food Facts, Elementary Volume 5--Language Arts (Prefixes), and Social Studies Volume 1.

Work during FY 1989. Final modifications were made to the talking version of Food Facts. The supplement, to accompany the talking disk and original MECC manual, was completed. After consultants evaluated Food Facts, and a final in-house review was conducted, the modified version was submitted to MECC for final approval and then turned over to production. This program is now available.

Elementary Volume 5--Language Arts (Prefixes) was completely reworked in order to operate more quickly, to keep student records, and to set up each file so that the teacher will eventually be able to alter the files in any way desired. [This feature is built in, but not currently usable.] The puzzles on the disk were also improved and the question/answer choices were randomized to provide greater use of the program for each student. The program was reviewed several times in-house and by outside consultants. Many "bugs" in the program needed to be worked out before the final version worked appropriately.

The supplement, to accompany the talking version of Prefixes (which includes talking versions of the original Prefixes print worksheets) and the original MECC manual, was rewritten for the revised program. The word lists used in the Prefixes program were included in the supplement in large type and braille so that the blind students' activity would not be made more difficult by becoming a spelling problem in addition to the task presented. The supplement discussing the changes and new operational features of the program was reviewed and edited.

The final draft of Elementary Volume 5--Language Arts (Prefixes) was sent out for evaluation. Several suggested changes were made by the consultants.

Following an in-house review of Social Studies Volume 1, it was decided that the program would not be useful to teachers unless more background information for using each program on the disk was provided. A social studies teacher who worked on the original MECC version was contacted regarding writing the necessary background information for each unit and the student worksheets necessary to the unit. Mr. Loren Dunham provided suggestions for improving the current documentation by including an enhanced INSTRUCTIONAL DESIGN MODEL. Mr. Dunham developed the necessary background information for one of the programs, USPOP, on the Social Studies Volume 1 disk as a prototype.

MECC was contacted regarding obtaining permission to adapt three more of their programs, Writing A Narrative, Oregon Trail, and Word Munchers. At the time of this writing, permission had not been received.

Work planned for FY 1990. After the final in-house review of Elementary Volume 5--Language Arts (Prefixes) is completed and MECC's approval of the finished modified product is received, the program materials will be turned over to production. APH intends to contract with Loren Dunham to prepare the background information necessary to make the programs on the Social Studies Volume 1 disk useful to teachers and their visually handicapped students. After this information is available, the remainder of the supplement to accompany the talking version of this program and the original MECC manual will be drafted. The programs on the disk will then be further modified as needed. These materials will be reviewed in-house, revised, and sent out for evaluation. After final modifications have been made, the program will have a final in-house review, be sent to MECC for approval of the modified version, and be turned over to production.

If permission to adapt one or more of the MECC selections last requested is not received, additional MECC programs will be reviewed for possible adaptation.

SEI Software (continuing)

Purpose: To adapt educationally sound, commercially available software for use by visually handicapped persons

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Committee Meeting, a modified version of Sliwa Enterprises, Inc. (SEI) educational software series was given high priority. The content of each SEI program is appropriate for high school and college students as well as adults. APH was able to make an arrangement with SEI for a customized edition of 33 of these programs. Production approval for this series has been received.

Before going to production, each disk was thoroughly checked for any factual or grammatical type errors; a camera-ready introductory page, title page, and reference guides were prepared to accompany the large type manual for each program. The same materials were also prepared for braille. SEI complied with APH request that an updated version of TEXTALKER be used on its disks to make the programs compatible with the Apple IIGS. Prior to FY 1989, 20 programs were turned over to production.

Work during FY 1989. Adaptation was completed on the other 13 programs and they were submitted for production. Project staff worked with production personnel as needed on manufacturing the programs. All 33 APH/SEI talking software programs are available from APH. Sales of the programs are being monitored.

Work planned for FY 1990. No further development is planned regarding the SEI programs. Sales of the programs will continue to be monitored to determine the need for any further activity.



## Speaqualizer (continuing)

Purpose: To produce a speech synthesis system for IBMs

Project staff: Larry Skutchan, Systems Programmer  
Jeff Wheatley, Programmer  
Jim Robinson, Manufacturing Specialist

Background. The Speaqualizer is a hardware based access package for the IBM computer. It permits the blind user to use speech to examine text displayed on the screen.

Speaqualizer was developed by the Research Committee of the National Federation of the Blind. After obtaining production approval from the Educational Research and Development Committee, APH research staff members began working with the National Federation of the Blind to continue development of the device's firmware. It became available from APH in July 1987.

Work during FY 1989. Speaqualizer received several significant improvements including commands to completely turn off the speech for use by sighted people, additional information such as the color of a character and its background, and the ability to use the PAGE UP and PAGE DOWN keys on the IBM keyboard to read the entire screen. Of particular interest to word processor users, Speaqualizer also received the ability to read text word-by-word when using the IBM's LEFT ARROW and RIGHT ARROW keys when the cursor moves more than one character horizontally. In addition, code was installed to let the user set DIP switches on the Speaqualizer circuit board to tell Speaqualizer about specific hardware configurations and setting preferences.

Adaptations were made to the circuit board to allow Speaqualizer to work with the newer, faster machines. Attempts to make Speaqualizer function properly on the Model 25 and 30 were determined to be unpractical in terms of user installation. It was found, however, that Speaqualizer already works with the Model 30/286.

Problems cropped up with the version for the PS/2 models with the micro channel bus architecture. Test equipment has been approved for use in solving these problems.

Work planned for FY 1990. The version of Speaqualizer for computers using the micro channel bus will be completed. Software enhancements will continue to improve Speaqualizer's usefulness. A Spanish version of this system may also be developed. APH also continues the search for improved speech quality at low cost to the user.



Talking Literacy Kit (TALK): Apple II Computers (continuing)

Purpose: To provide an introductory set of speech-accessible computer software and related materials for any of the current Apple II family of computers which could be easily integrated into existing programs of computer literacy or introduction to computers for legally blind youth through adult beginners

Project staff: Debbie Willis, Project Director  
Jeff Wheatley, Programmer  
Larry Skutchan, Systems Programmer  
Cathy Talbott, Project Assistant

Background. During the fall and winter of 1985, the Talking Apple Literacy Kit (TALK): //e Edition was in the production pipeline of APH. The product became available in September 1986. First run sales were most encouraging. Subsequent runs of the kit were initiated and sales remained brisk. In response to requests from the field, APH offered sets of the Brailled Keyboard model for the Apple //e, a component of the TALK, as a separate item. The name of the kit and other components were changed in 1987 in order to be in compliance with the legal guidelines of Apple Computer, Inc.

At the Fifth Microcomputer Advisory Committee Meeting, a revision of the kit to include all current Apple II computers received high priority. Work on two components of the revised kit, the Brailled Keyboard Overlay for the Apple IIGS(R) and the disk introducing the keyboard, word processing, and games was started.

Work during FY 1989. Work on the disk was continued. The introductory word processing program, introductory games, and keyboard practice were programmed for speech and large print output to the screen. The program was named LetterTALK+. Documentation to accompany the disk was drafted. The program was reviewed in-house several times and underwent many changes.

Work on the Brailled Keyboard Overlay for the Apple IIGS also continued. Prototypes of the overlay were developed, checked for accuracy, tested for legibility, and a brief supplement to accompany the product was written. After some revisions, the materials were completed and turned over to production. It was decided to offer LetterTALK+ and the Braille Keyboard Overlay for the Apple IIGS as separate products from the kit. The overlays were produced and are being sold separately from the kit in packages of five.

Work planned for FY 1990. The documentation and reference sheets for the disk introducing the keyboard, word processing, and games will be completed. The disk and its accompanying documentation will be evaluated by consultants. After modifications to LetterTALK+ have been made, the materials will have a final in-house review and then be turned over to production.

The software disk entitled APH Presents the Talking Apple will be reworked to include features of the Apple IIGS, new features of TEXTALKER, and suggestions from the field. The manual will be updated and rewritten to include current information. The computer parts collection in the kit will be reviewed and updated. Components will be added, deleted, or changed as needed.

The final revised kit will be evaluated by at least two consultants. After final revisions and a final in-house review, the Talking Literacy Kit (TALK) for Apple II Computers will be turned over to production.

Talking Typer (continuing)

Purpose: To provide students/clients and teachers with appropriate software and documentation for use in teaching and learning typing skills with computers

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Rob Meredith, Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Committee Meeting, a typing program called Kids Can! Typer, developed by Ted Hasselbring and Carol Hamlett for sighted special education students, was demonstrated and discussed. The advisory group gave a speech-adapted version of this program a high priority. APH acquired complete marketing rights to the speech-adapted version and contracted with Carol Hamlett to make the necessary programming changes. Production approval was requested and received for this product.

An initial version of the adapted program (teacher disk, student disk, and documentation) was completed. The three components were thoroughly reviewed by in-house staff and several major "bugs" were found. A review of the entire program with suggestions for changes was sent to Carol Hamlett. While initial plans had not included adding speech to the teacher disk, Miss Hamlett reprogrammed that disk to make all the essential information being presented to the screen talk. A revised version was sent to APH. A preliminary review indicated there were still too many problems in the program's operation to send it out for formal evaluation and the manual was difficult to follow. Therefore, more revisions were required.

Work during FY 1989. All known bugs were eliminated, several speech oriented enhancements (including complete speech support for the editor) were installed, and the documentation was appropriately revised. After numerous in-house reviews and changes, a final draft of the entire Talking Typer program was sent out for evaluation by consultants.

Work planned for FY 1990. The Talking Typer program will be completed. Future enhancements will be dictated by responses from users.

Telecommunications (new)

Purpose: To create a tutorial that introduces blind students, clients, and teachers to telecommunications; what it is, its wide array of uses, how to communicate via modem with other computers, how to access national services and bulletin boards

Project staff: Microcomputer Group

Background. At the Fifth and Sixth Microcomputer Advisory Committee Meetings the need for materials to introduce students and teachers to telecommunications was expressed. "Networking," "telecommunications," and "distance learning" have quickly become projects of great importance in the schools. There is little doubt that introductory materials in the area of telecommunications are needed.

Work during FY 1989. Several introductions to telecommunications and simulations of bulletin boards were found and reviewed. Introduction to telecommunication classes for visually handicapped students were observed and taught.

Work planned for FY 1990. A set of materials to introduce students, clients, and teachers to telecommunications will be further researched and designed. Development of this product will begin this fiscal year.



TEXTALKER (continuing)

Purpose: To incorporate features specifically recommended by blind users into the TEXTALKER software and to set standards for use of speech synthesis on the Apple II

Project Staff: Larry Skutchan, Systems Programmer  
Rob Meredith, Programmer

Background. TEXTALKER is the software that works with the Echo synthesizers to provide the Apple with synthesized speech. It was written by Street Electronics Corporation. Members at the Third Microcomputer Advisory Committee Meeting recommended the program be modified to more accurately reflect the needs of the blind user and to help set standards for talking software. The research staff gathered information from several sources including a survey conducted by Bob Glass, the suggestion files at Street Electronics, comments from end users, and observations of users in the field. With the cooperation of Street Electronics, several improvements were added to the system that both enhanced productivity and increased ease of use. One of these features, the ability to silence any text with any keystroke, has become a standard not only on the Apple, but in many IBM screen access packages. (APH's own Speaqualizer supports this feature.) APH's initial version of TEXTALKER was released as version 3.1.1. Later, with the introduction of the Apple IIGS, TEXTALKER received changes that permitted it to function at the new computer's higher processing speeds. This and enhancements that enabled the user to define columns for reviewing purposes were installed and the program was released as version 3.1.2.

Work during FY 1989. As the microcomputer group observes end users and notes suggestions on user survey cards, enhancements are designed and installed. Some of the more significant features added during this year include the addition of phonetic pronunciation of letters when desired, a new "quick silence" feature that stops the speech until the next carriage return, and several performance improvements. The microcomputer group has also begun making a version of TEXTALKER that takes advantage of some of the advanced hardware features of the Apple IIGS to provide greater access to more off-the shelf software packages and some of the built-in software on the IIGS.

Work planned for FY 1990. The microcomputer group will focus its TEXTALKER efforts on greater accessibility to off-the-shelf software by taking advantage of some of the advanced hardware features of the Apple IIGS.

Utilities Disk (continuing)

Purpose: To produce a utilities disk

Project staff: Larry Skutchan, Systems Programmer

Background. Participants of the Third Microcomputer Advisory Committee Meeting recommended that APH produce disks of most often needed utility programs that functioned with speech. This would allow the teacher and student to perform all the most needed disk maintenance operations with dependable talking software which would be available from one place. Such a disk was approved for production.

The research staff obtained the source code to two of the utility programs from Apple Computer, Inc. and began modifying them.

Work during FY 1989. The ProDOS version of the utilities package received some minor enhancements that included the correction of a problem involving the FILER program when used on an Apple IIGS to copy DOS 3.3 disks, the installation of code that made the CONVERT program check if ProDOS quit code was installed, and if it was, to use that when leaving the program, and the addition of support for the SlotBuster synthesizer. The DOS 3.3 version of the utilities disk was completed and turned over to production.

Work planned for FY 1990. The utilities project is complete. Future enhancements will be dictated by responses and suggestions from the field.

The World Book Encyclopedia, Disk or CD-ROM Edition (continuing)

Purpose: To provide a special edition of The World Book Encyclopedia which would be accessed via technology

Project staff: Larry Skutchan, Project Director

Background. APH has produced two special editions of The World Book Encyclopedia. The first was a braille edition of the 1959 reference work and the second was a recorded edition based on the 1978 and 1979 editions. Updated information was provided for the latter through provision of three supplements; The World Book Year Books for 1980 and 1981, 1982 and 1983, and 1984 and 1985. Due to the age of the main reference work, a decision was made not to produce any subsequent combined yearbooks. However, visually handicapped students need access to a major reference work such as this encyclopedia, which is the most widely used encyclopedia for educational purposes.

APH met with World Book personnel and learned that World Book is still interested in working with APH and that the text is available in electronic form.

Work during FY 1989. APH received the text in electronic format and obtained equipment to read. Investigation was initiated into the feasibility of developing retrieval software to run on the Apple II line of computers.

Work planned for FY 1990. Investigation and development will continue in two areas. First, software will be developed or adapted to quickly retrieve information from the text, and a determination will be made on the most appropriate media on which to offer the electronic edition. CD-ROM and floppy disk editions are under consideration.

Other Activities





Academic and Test Needs Survey (continuing)

Purposes: To (a) identify specific academic materials needed in the areas of language arts, mathematics, science, and social studies; (b) to identify specific academic measures needed; and (c) to determine the sources of funds used for the purchase of special educational materials for visually handicapped students

Project staff: Bill Duckworth, Project Director  
Karen Poppe, Project Assistant

Background. At its May 1987 meeting, APH's Educational Research and Development Committee recommended, "That the Department of Educational Research again survey the field to see if there are emerging needs in the science, mathematics, and social studies areas." At the same time, plans had been made to conduct a survey of test needs. These surveys were combined and expanded slightly in scope.

A survey form addressing the above listed purposes was developed and sent, in the spring of 1988, to 31 instructional resource centers and 7 selected residential schools for the blind offering academic programs. For each of the academic areas queried, responses were in the form of specific texts and other teaching materials needed, as categorized by educational level (i.e., preschool/readiness, primary, elementary, middle school, and high school). Results indicated needs for a wide array of textbooks with little consensus between responding agencies/institutions. This information will be used by APH's Editorial Department in developing recommendations for texts to be produced by APH in braille and large type.

Work during FY 1989. The report on this survey has to be finalized.

Work planned for FY 1990. The report will be completed.

Feasibility of Conducting a National Study of Academic Achievement

Purpose: To determine the feasibility of implementing such a study

Project staff: June Morris, Project Codirector  
Carson Nolan, Project Codirector

Background. Academic achievement of legally blind students has long been of interest to persons responsible for their education. In the early 1940s, Samuel P. Hayes reported on use of the Stanford Achievement Test with 600 blind students in grades 4-9. Results of his study showed achievement curves for all subject matter tests to closely follow those for the sighted norm group except in Arithmetic Computation where the blind students fell considerably below the sighted norms.

Much more recently (APH's October 1983 Annual Meeting), in response to widespread concern about the academic achievement of blind students, June Morris proposed using the then new Forms E and F of the Stanford Achievement Test to measure academic achievement on a national sample. To determine the feasibility of conducting such a study, 14 ex officio trustees were contacted and asked if it would be possible for them to participate in such a study by having their teachers administer the tests if APH were to identify a sample of students to be tested, provide the tests and their directions, score the tests, and provide test results for the students tested. The response was an overwhelming no. Reasons cited included teacher time required, student time required, infrequent contact with students in rural areas served by itinerant teachers, and that cooperation would be unpredictable (e.g., parental approval would be required and the ultimate decision often would be at the local level).

Subsequently, APH contacted a number of states to learn if it would be feasible to obtain and use information from minimum competency tests to identify trends. This too did not prove possible because complete data were not available from any state contacted.

The need for information about academic achievement was once again brought up at APH's October 1987 Annual Meeting when its Educational Research and Development Committee recommended plans be implemented to conduct a nationwide study of academic achievement using the new (Series 8) Stanford Achievement Test--Form J, during the 1989-90 school year.

Work during FY 1989. Carson Nolan and June Morris met with top level personnel from The Psychological Corporation, publisher of the Stanford Achievement Test, regarding how such a study might be done. Variables to be incorporated were identified to correspond with the norming sample and an experimental design was planned that would meet minimum requirements for validity and reliability. The cost for conducting this study was projected at between \$1,000,000 and \$2,000,000. The unanimous decision was that it was not economically feasible to undertake such a study. This information was reported at the Formal Meeting of Ex Officio Trustees held in October 1988.

Technical Research Division





Technical Research Division (previously APH's New Products Department)

Purpose: To develop products involving high-technology and to introduce other new products for production

Division staff: Bob Phelps, Manager  
James Robinson, Manufacturing Specialist  
Frank Hayden, Manufacturing Specialist  
Darlene Donhoff, Technical/Clerical Assistant

Background. For many years APH personnel from its research and new products departments have worked closely together in the development of electronic and other technological products and in the process of transforming experimental prototypes of new products into manufactured goods. Because of this close relationship, in January 1989 an organizational change was made in which the New Products Department became the Technical Research Division of the Department of Educational and Technical Research (previously the Department of Educational Research).

Work during FY 1989. The following briefly describes projects addressed by this division:

APH Portable Plus Record Player; Making changes on amplifier and awaiting new samples. Waiting for samples of cases. Investigating the feasibility of manufacturing case in-house.

Speaqualizer; Completed "Turn Off" label, opened work orders for braille and large type Users Manuals. Translated 2.2 Update Addendum into braille. Large type and braille work orders opened for productions of Update Addendum. Work order opened for assembly and packing of Speaqualizer. Worked on writing up test procedures for manual and bill of materials for APH Management System. Issued stock transfer for the Speaqualizer Upgrade Kit to be pulled from stock so that it could be revised.

APH PocketBraille; First work order of 100 units completed and sent to shipping. Second work order of 100 units nearly completed. Working on drawings for assembly and packaging and completing manufacturing manual. Worked on a bill of materials for APH Management System.

\*External Memory Module; Received all modules ordered (103 pieces in-house), completed work order for testing and packaging, and sent to shipping. Worked on a bill of materials for APH Management System.

\*Screen Door for the Apple II; Still in development stages, there were some design problems which needed resolved.

\*Screen Door for the IBM; Readied for tooling and production samples.

Talking Utilities for ProDOS and DOS 3.3; Completed ProDOS and sent to shipping on March 24, 1989. DOS 3.3; braille translation on disk, large type manuals completed, braille manual sent to production.

APH/SEI Talking Software Programs; Received all remaining disks, completed all work orders for final packing, and sent to shipping. Worked on a manual and bills of materials for APH Management System.

Playing the Crucial Role in Your Child's Development, VHS video cassette version; Completed work order for packaging and sent to shipping. Completed manual and bill of materials for APH Management System.

Handi-Cassette Carrying Case; Received a suitable sample and issued an order for manufacturing of cases. First shipment received in May.

Bright Sights; Washing instruction labels--checked with vendors for samples and prices. New injection-molded pegs--placed an order with vendor for tooling and samples which arrived in May.

Sensory Stimulation Kit; Worked up a bill of materials for the Sensory Stimulation Kit, which will be used in planning the final bills of material structure for APH Management System.

Work planned for FY 1990. Upcoming projects will include:

\*Screen Door for the Apple II; will be continuing to work on this.

\*Screen Door for the IBM; will be continuing to work on this.

\*Refreshable Braille Display; Looking at 20-cell displays to work with Speaqualizer, APH PocketBraille, and possibly other products.

Speaqualizer Key-Pad Control Box; redesign.

Speaqualizer IBM PS2 Model 50; continue development.

APH Scientific Calculator: for the Apple II computer and other software; facilitate production.

AC/DC Rechargeable 4-track Cassette Tape Recorder/Player; Will be working in conjunction with Thompson Consumer Electronics on the redesign of the #5194 General Electric Tape Machine and to develop a handicap-lever for the General Electric Tape Player #5194.

APH PocketBraille; Preliminary planning to start redesigning.

Develop a mat and the electronics for an early childhood Sensory Mat.

Develop Repair Procedures for current Electronic Products:  
APH PocketBraille, Speaqualizer, Echo Commander.

Continue working with APH Management System to bring up the manufacturing portion.

\*for use with APH PocketBraille





Agencies Participating in Research

In addition to the agencies named here, appreciation is also extended to the many other agencies which cooperated with APH's research efforts by permitting members of their staffs to serve as consultants or respondents to requests for information.

Apple Computer, Inc.; Cupertino, California  
Blind Babies Foundation; San Francisco, California  
Carr School; Lincoln Park, Michigan  
Central Pennsylvania Special Education Resource Center; Harrisburg, Pennsylvania  
Children's Center for the Visually Impaired; Kansas City, Missouri  
Colorado School for the Deaf and the Blind; Colorado Springs, Colorado  
Coyle Avenue School; Carmichael, California  
Davidson Engineering; Morristown, Tennessee  
Detroit Public Schools Program for the Visually Handicapped; Detroit, Michigan  
Division of Blind Services; Lafayette, Louisiana  
Expert Systems Software, Inc.; Nashville, Tennessee  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
Foundation for Blind Children; Scottsdale, Arizona  
Foundation for the Junior Blind; Los Angeles, California  
Glen Cove Elementary School; Vellejo, California  
The Governor Morehead School; Raleigh, North Carolina  
The Greater Pittsburg Guild for the Blind; Bridgeville, Pennsylvania  
Illinois School for the Visually Impaired; Jacksonville, Illinois  
Jefferson County Public Schools; Louisville, Kentucky  
Johnson Elementary School; Denver, Colorado  
Kansas State School for the Visually Handicapped; Kansas City, Kansas  
Kentucky Department for the Blind; Frankfort, Kentucky  
Kentucky Rehabilitation Center for the Blind; Louisville, Kentucky  
Kentucky School for the Blind; Louisville, Kentucky  
Lawton Elementary School; San Francisco, California  
Los Angeles County Office of Education; Canyon County, California  
Marina Middle School; San Francisco, California  
Minnesota Educational Computing Corporation (MECC); St. Paul, Minnesota  
National Federation of the Blind; Baltimore, Maryland  
National Special Education Alliance; Cupertino, California  
New Hampshire Educational Services for the Visually Handicapped; Concord, New Hampshire  
New York Institute for Special Education; New York, New York  
Overbrook Educational Center; Philadelphia, Pennsylvania  
Overbrook School for the Blind; Philadelphia, Pennsylvania  
Perkins School for the Blind; Watertown, Massachusetts  
Pinellas County Schools; St. Petersburg, Florida  
The Psychological Corporation; San Antonio, Texas  
RC Systems; Bothell, Washington  
St. Lucy's Day School; Philadelphia, Pennsylvania  
Sensible Software; Troy, Michigan  
Sliwa Enterprises, Inc.; Yorktown, Virginia  
Street Electronics Corporation; Santa Barbara, California  
Tennessee School for the Blind; Nashville, Tennessee  
Valle Verde Elementary School; Walnut Creek, California  
Visually Impaired Preschool Services; Louisville, Kentucky



### Consultants

In addition to the consultants formally acknowledged in this section, appreciation is extended to the many individuals who have willingly given of their time and expertise in cooperating with the various research and development projects underway by responding to questionnaires, by answering less formal queries for information, and by working with research staff in countless ways such as: (a) identifying particularly talented teachers and other professionals to serve on committees and/or as expert reviewers; (b) recommending programs, teachers, and students appropriate for field evaluation sites; and (c) facilitating field evaluation efforts. Only through the splendid and continuing support of professionals working in the field and the people they serve is APH able to maintain its highly effective research and development program.

### Assessment of Visual Potential Instrument

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Ms. Robin Boyd, Teacher of the Visually Handicapped, Meadowview Elementary School, Meadowview, Virginia



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Teaching for Rehabilitation Success/Visually Impaired

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New Products

Microcomputer Related Products

Hardware

Cassette Tape Interface Device (APH PocketBraille accessory)  
External Memory Module (APH PocketBraille accessory)  
6-foot Parallel Printer Output Cable (APH PocketBraille accessory)  
Speaqualizer Upgrade Kit

Computer Literacy

Braille Keyboard Overlay for the Apple II<sub>GS</sub>

Educational Software

MECC: Food Facts  
SEI: Afro-American Literature  
SEI: American History 2  
SEI: American History 3  
SEI: American History 4  
SEI: American Poetry  
SEI: Ancient Civilization  
SEI: Asian/African History  
SEI: Dickens  
SEI: Early American Literature  
SEI: Edgar Allen Poe  
SEI: European History 1  
SEI: European History 2  
SEI: Fantasy  
SEI: High School Literature 1  
SEI: High School Literature 2  
SEI: High School Literature 3  
SEI: History of Space Flight  
SEI: Mark Twain  
SEI: Modern British Literature  
SEI: Mystery  
SEI: Mythology  
SEI: Science Fiction  
SEI: Sentence Completion  
SEI: Shakespeare 1  
SEI: Shakespeare 2  
SEI: Short Story  
SEI: Steinbeck/Faulkner/Hemingway  
SEI: United Nations and Foreign Governments  
SEI: Woman Authors  
Teacher's Pet

Educational Aid and Tools

Handi-Cassette Carrying Case



Braille/Tactile Materials

Brigance Diagnostic Comprehensive Inventory of Basic Skills (Green):  
    APH Tactile Supplement  
Patterns Prebraille Program













**American  
Printing House  
For The Blind  
Incorporated**

**Department of Educational and Technical Research  
Report of Research and Development Activities  
Fiscal 1990**

*American Printing House for the Blind  
1839 Frankfort Avenue  
Louisville, KY 40206*



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The American Printing House for the Blind's (APH) ongoing research and development program is designed to be pragmatically efficient. Its goal is to enable APH to provide the special products most needed to facilitate the education and rehabilitation of the special population it serves. This report provides brief descriptions of research projects underway during FY 1990 and planned for FY 1991. Project descriptions indicate different stages of development as would be expected in an ongoing R & D program. Generally, these stages fall into the identification of specific needs within an area, research and/or development planning, development of experimental materials, model review, evaluation, revisions, preparing for entering APH's production pipeline, and writing reports and articles. Consultants of various types are used at different stages and on different types of projects. Experts in specific areas are used to help identify specific product needs (within a designated high priority area), determine specifications for new products, and review prototypical models. Others are used to assist in experimental design and analyses. Still others, such as professional curriculum developers/writers, linguists, psychologists, etc., are used where needed.

The majority of work reported reflects the high priority areas determined by Educational Research and Development Committees serving APH. Currently, these high priority areas are for materials development activities in the areas of early childhood, multihandicapped, technology, and braille training materials.

This year, as before, cooperation with APH's various projects by persons working in the field and being served by the field has been splendid. It is only through this ongoing support of APH's work that it has been able to serve so well.



## Early Childhood





Developing Literacy: Basic Skills, Concepts, and Early Experience  
(continuing)

Purpose: To provide a program and materials for teachers and parents of young visually handicapped children to assist them in providing, from birth, the experiences and interaction necessary to develop and interrelate skills for literacy

Project staff: Suzette Wright, Project Director and Coauthor  
Josephine Stratton, Project Coauthor  
Tom Poppe, Model and Pattern Maker

Background. The word "literacy" is used to refer to a person's ability to use symbols--the alphabet--to read and write. A more accurate definition of literacy, however, means much more. "Literacy" is a child's (or adult's) ability to use his own experiences and ideas to bring meaning and understanding to a story. It is also the ability to express ideas so that others are able to understand. This ability begins to develop at birth. The child's first communication, use of hands to grasp, first attempts to move his body, and to understand his experiences are all a part of developing literacy. Developing literacy is a process made up of many events occurring over a period of time. Motor development enables the child to explore, to gain experiences, and to build understandings for stories he hears, and later reads. Language development enables the child to communicate with others and to understand and enjoy stories. Language and hands-on experience together each increase the meaning of the other. Listening to stories from a very young age provides the child with opportunities to recall and extend his own experiences, think about new ideas, enjoy the patterns of "book language," and predict what will happen next. Learning to read for all children is a gradual process which includes all of the child's development and experiences from birth as they combine in building a foundation for literacy.

For the blind or visually impaired child, literacy is the same gradual process, and emerges from experiences that are meaningful to him. He needs the same opportunities for experiences as all children do. For some visually impaired children, however, the emphasis or the way of learning may be somewhat different. He needs opportunities to:

- develop motor skills fully
- explore the environment tactually
- develop language that is meaningful to him
- handle books that are tactually interesting to him
- listen to many stories that do not depend on visual experiences or pictures
- gain added enjoyment and meaning from stories through tactile pictures

Work during FY 1990. All project materials were revised, duplicated, and placed in the field for evaluation.

The revised parent/teacher handbook was translated from an IBM disk to the Macintosh for editing and formatting. Necessary additions and corrections were made to the text and to the appendices. Title pages, table of contents, and other segments of the handbook were created. Basic formatting was performed using Pagemaker, and space was left for illustrations; these will be added after final revision to the text have been determined. Sketches which will serve as illustrations for the handbook have been completed.

Revisions to the original eight tactile storybooks which were suggested at the last meeting of the advisory committee were completed. This involved rebrailleing portions of the text and re-embossing tactile illustrations. Corresponding changes were made to the printed text and graphics. It was also necessary to redesign storybooks which used thermoformed, silkscreened graphics on Polyblend plastic; a silkscreen ink which could withstand the thermoforming process is not manufactured for that particular plastic. These storybooks now feature clear thermoformed overlays over colored, ink-print illustrations. This represents an improvement over the original design: potential problems registering the silkscreened and thermoformed portions of each graphic are eliminated, the expense of silkscreening is replaced with the lower cost of printing, and the printed illustrations offer more color for the low vision student. Three additional storybooks approved in draft form by the committee were completed, brailled, and their tactile graphics were drawn and embossed. Six copies were made of each of the resulting 11 storybooks. Altogether, the storybooks utilize six media; printed text, brailled text, colorful ink illustrations, raised line illustrations, thermoformed illustrations, and objects and textures applied to the page.

The evaluation forms to be used in the field were drafted, revised, and approved by an in-house committee and an outside member of the field who reviewed each of the five forms (Teacher: Handbook; Teacher: Storybooks; Parent: Handbook; Parent: Storybooks; and Child Data Sheet). Five evaluation sites were selected; the handbook and storybooks were mailed to evaluation sites during the first week of April. Four sites returned their completed forms. A total of 8 teachers and 14 parents evaluates the handbook and storybooks with 27 preschool age students for an 8-10 week period.

Their evaluation of the handbook indicated several areas where additional information was desired--extension of language and dressing skills as they relate to hand skills. No major changes were suggested and all expressed overall satisfaction with the organization and content of the handbook. The tactile/visual storybooks received the approval of evaluating teachers. The level of interest and progression of tactile graphics from real objects and thermoformed objects to raised line drawings was approved. Changes to the raised line drawings in one book were suggested by an evaluator to more clearly show spatial relationships and the orientation of objects. No other major changes were recommended. Asked to assess students' interest in the storybooks, information returned by teachers indicated highest interest in thermoformed and real object storybooks--particularly for younger students and potential braille readers.

Pending final revisions, the Developing Literacy materials were approved for production in June 1990.

Work planned for FY 1991. Final revision to the handbook will be made. Final formatting and illustrations will be added once all text changes are completed. Final specifications for each of the tactile/visual storybooks will be determined and will be written into a production document. The parent/teacher handbook and 11 tactile storybooks will be turned over to the Production Department and a final report of all project activities will be written.



Infant Skills Project (continuing)

Purpose: To develop a collection of tangible child-use materials targeted for infants and toddlers, birth-24 months, and to develop accompanying written material useful in developing critical skills in young children

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant  
Tobey Burton, Project Assistant

Background. The purpose of the most recent Early Childhood Materials Needs Assessment meeting was to develop recommendations for specific early childhood educational materials research and development projects. The committee delineated and set priorities for five specific areas, with the Infant Skills project receiving a high priority rating. This high priority correlates with the emphasis at the federal level to initiate and strengthen infant/toddler programs throughout the United States under PL 99-457.

Work during FY 1990. Staff continued to source and keep abreast of relevant literature to the Infant Skills Project. Literature surveys included areas such as child development, special education for young children, pediatric medicine, pediatric ophthalmology, family structure and development, service delivery options, physical therapy, occupational therapy, and educational programs and services. In addition, the agencies/services program databases, to be utilized in this project, were expanded and updated. The data from a teacher survey, querying teachers of infant visually impaired and blind children as to useful and needed educational materials as well as helpful resources and references, were posted, analyzed, and checked. These data served as an important basis for the collection of both APH developed educational materials and commercially available items that facilitated the development of critical skills in young visually handicapped children. Specifications were developed for the APH designed and developed materials to be included in the Infant Skills Kit. Staff have made arrangements for the evaluation of this set of materials. After materials were finalized, each item was sourced and obtained from its distributor. In addition, activities were written for all materials presently included in the Infant Skills Kit. Various designs of the carrying case for the tangible items were also explored.

Along with the tangible materials in the Infant Skills Kit, additional supporting materials will be included in the form of an activities manual for teachers. A second resource/support guide will be included, namely the Parent Early Childhood Education Series by the early childhood staff of the Overbrook School for the Blind. This series, described more comprehensively in a separate project report, entitled "Parent Early Childhood Education Series," was evaluated extensively by a number of experts in the area of early childhood vision. This series will also be available for separate sale without the accompanying Infant Skills materials.

Work planned for FY 1991. Several project activities remain prior to completion of the Infant Skills materials, and their entry into the production pipeline. These activities are listed in the order in which they will occur. Conduct a field evaluation of the Infant Skills materials and accompanying activities, after sourcing and obtaining multiple sets of all materials. Field evaluation sites will be contacted, and permission to participate will be obtained. An evaluation component will be designed, and appropriate questionnaires will be developed. Throughout the evaluation, staff will keep in contact with and monitor field evaluation sites. Field evaluation data will be posted and checked for accuracy. An analysis will be made of these data, and revisions to the tangible materials as well as to the accompanying activities, will be determined. Staff will implement all revisions, and will decide if the extent and nature of the revisions warrant additional field trials. Following final testing and any necessary revisions, all materials will be readied for introduction into the production pipeline. Production documents will be prepared and project staff will meet on a regular basis with production personnel. A final report will be written, detailing all aspects of project development.

Parent Early Childhood Education Series (continuing) (previously included under Infant Skills Project)

Purpose: To evaluate and revise a set of written materials useful in developing critical skills in young visually handicapped children

Project staff: Sheri Moore, Project Director  
Bernadette Kappen, Project Codirector  
Karen Poppe, Project Assistant

Background. The most recent Early Childhood Materials Needs Assessment meeting developed recommendations for specific early childhood educational materials research and development project. The committee delineated and set priorities with infant materials receiving the highest priority rating. This high priority correlates with the emphasis at the federal level to initiate and strengthen infant/toddler programs throughout the United States under PL 99-457.

Work during FY 1990. The Parent Early Childhood Education Series is a set of written materials detailing suggestions, recommendations, and activities for working with visually handicapped young children. This guide, developed as the Parent Early Childhood Education Series by Overbrook School for the Blind's early childhood staff, contains a great deal of excellent information. A wide array of relevant subjects are addressed in this series, including topics such as:

- General suggestions for infants with visual impairments
- General suggestions for the multiply handicapped young child
- Terminology--words relating to vision impairment
- Developing eating skills, including general suggestions, spoonfeeding, cup drinking
- Promoting orientation and mobility skills
- Tactile stimulation activities
- Sensory development activities
- Developing vision skills
- Selecting equipment and toys
- Developing refine motor skills
- Positioning and movement
- Cognitive development
- Siblings and suggestions for family life
- Developing listening skills
- Parent-child interactions
- Developing language and communication
- Developing social skills
- Early parent-child interaction
- Socialization
- Stereotypic mannerisms--prevention and extinction



Following review of the Overbrook materials by APH staff, numerous contacts were made to locate expert reviewers. The list of reviewers was finalized, and materials were prepared for shipment to the reviewers. In addition, a comprehensive evaluation form was developed to structure the response of the expert field reviewers. The evaluation form consisted of a general component and also rating guidelines for individual page evaluations. General evaluation questions requested an array of information, including:

Summarize your general impressions of the usefulness of these materials. Comment on the population(s) of children/parents/professionals for whom these materials will be most appropriate.

Detail ways in which these materials could be improved.

Comment on the usefulness and quality of the print and the graphics.

What topical/content areas should be deleted, if any?

What topical/content areas should be added, if any?

Suggest format and packaging possibilities for these materials.

Are these materials appropriate for families with multicultural considerations? If not, detail specific suggestions for improvement.

If toys/educational materials were to accompany these materials, what items would you recommend for inclusion? (Consider toys, available APH items, or ideas you have that would need to be developed.)

General comments

Content reviewers were also asked to individually evaluate each page of the Parent Early Childhood Education Series. Reviewers were requested to "grade" each page and write comments regarding specific suggestions for that page directly onto the copy. When all content/expert reviewers had completed their reviews, all data were posted and checked. Subsequently, all data were analyzed and a list of suggested changes to the materials was developed. Project staff then met with the Overbrook project codirector, and reviewed all recommendations for additions, changes, and deletions. Each suggestion was reviewed and considered; a final listing of all revisions was generated. A timetable was discussed for the completion of all revisions.

Work planned for FY 1991. Project staff will coordinate all revisions to the Parent Early Childhood Education Series with the Overbrook codirector. Following the completion of all revisions, the materials will be included as part of the Infant Skills Kit. Ultimately, the Parent Early Childhood Education Series will be included as a component of the Infant Skills Kit as well as being made available for separate sale. Following the field trial with the Infant Skills materials, additional revisions may be made to the Overbrook materials, depending on an analysis of the field evaluation data. Data will be posted and analyzed; project staff will again meet with Overbrook staff to determine any needed additions, changes, or deletions. Project staff will develop a production document and guide the series through the production process.



Preschool Learning Activities (continuing)

Purpose: To develop an instructional manual of learning activities appropriate for blind and visually handicapped preschoolers, ages 3-, 4-, and 5-years old

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant  
Tobey Burton, Project Assistant  
Tom Poppe, Model and Pattern Maker

Background. APH has begun to develop a continuum of educational materials for the 3-, 4-, 5-, and 6-year old age group. This is particularly timely, with many additional preschoolers being served through PL 99-457. This specific project involves a manual of varied and numerous learning activities, specifically designed to make use of common objects in the development of a continuum of sensory skills and important concepts. Activities are designed to address skills that often require a great deal of practice, such as squeezing, pouring, sorting, categorizing, classifying, sequencing, and so on. The activities make use of environmental materials such as sponges, buttons, nuts, rocks, pennies, silverware, basters, water, marbles, magnets, beads, golf tees, cotton balls, and clothespins. Special consideration is given in the manual to learning experiences beneficial to young visually handicapped children and also designed to foster integration experiences with sighted peers.

Work during FY 1990. The Preschool Learning Activities manual was completed in draft form. The manual title, which varies from the project title, is Hands On: An Activity-Based Approach to Teaching Basic Skills and Concepts to Visually Disabled Preschoolers. This extensive manual, numbering some 165 pages, is organized for providing ready access to a wide array of appropriate activities for visually impaired and blind preschool level children. Major components of the manual include: Introduction; Activity Section, including subsections of preliminary activities, dry transfer, wet transfer, stringing, folding, clipping, twisting, sorting, care of person, care of the environment, food preparation, work bench activities, art, and grace and courtesy; Ideas for parents/home activities; and Appendixes of hard-to-find items, suggestions for further reading, and resources on Montessori educational practices. The Hands On activity manual was formatively evaluated by eight local teachers or parents, familiar with programming for young blind and visually impaired children. Results of the formative evaluation were integrated into a revised manual.

Following revision of the manual, project staff sourced and gathered full complements of all materials needed to carry out the activities in the Hands On manual. This involved gathering materials for some 55 activities, many calling for multiple materials to perform the activity. A total of 10 sets of the materials needed for field evaluation were assembled. In addition, 6 trays were designed for the purpose of conducting all of the activities contained in the manual. Following the review of the tray designs in a formative evaluation, several minor design changes were made. In preparation for the field evaluation, 13 sets of the 6 trays were made.

Project staff sourced and contacted a number of preschool programs, representing public school, center-based, and integrated models, for participation in field evaluation of the Hands On materials. A total of 10 programs were selected for the field evaluation. Program supervisors and classroom teachers were contacted regarding their involvement in the evaluation process. An evaluation instrument was developed, requesting an array of information from the evaluating teachers. A general section of the evaluation form requests such information as child data on each student included in the field trial (name, age, visual acuity/functional use of vision, and other handicapping conditions). Additional components of the general evaluation deal with general impressions of the usefulness and value of the program; appropriateness of the activities; usefulness in mainstreamed and integrated settings; suggested improvements in the activity manual; skills not covered by the program that should be included; content areas and activities that should be added; content areas and activities that should be deleted; quality and helpfulness of the resources provided in the manual; usefulness and quality of the print, graphics, and format; comments on the program title; and improvements and comments on the tray design. Several additional questions dealt with general format considerations, packaging options, and other comments. A specific activity evaluation was also included for each of the 55 activities. Reviewers were asked to comment on the child's interest in the activity; accessibility of materials; appropriateness of the materials; importance of the skill for a visually handicapped preschool child; skill appropriateness for target age group; ease of teaching the skill; appropriateness of the tray; helpfulness of visual adaptation; value of creative extensions; clarity of procedure as described; evaluation of the photograph depicting the materials setup; overall need for the activity.

An exceptionally useful and comprehensive format was developed by project staff for recording each activity as well as related learning extensions. A summary of this format follows.

- |                    |   |
|--------------------|---|
| Materials          | - The necessary items.  |
| Earlier Work       | - Any activities that the child should have done first.                         |
| Procedure          | - A description of how to show the work to the child.                           |
| Points of Interest | - Anything that may capture the child's attention.                              |
| Variations         | - Activities that are variations on the theme.                                  |
| Extensions         | - Activities using one or more of the materials in a completely different way.  |
| Language           | - Vocabulary building.  |
| Math               | - Counting or adding.   |
| Science            | - Using the material to help understand the natural world.                      |
| Geography          | - Use of the material in learning about other countries or about water or land. |
| Sensorial          | - Using any of the five senses.   |
| Art                | - Using the materials creatively.   |
| Music              | - Songs related to the activity or materials used in the activity.              |

- |                 |   |
|-----------------|---|
| Books           | - Books related to the activity or the objects used in the activity.  |
| Games           | - Informal activities to promote socialization.   |
| Drama           | - Pretend play related to the activity.   |
| Problem Solving | - Used to further the child's concept of the materials by asking questions requiring flexible thinking, or it is used as an extension for using the materials in a more open-ended way. |

Pending final revisions, the product resulting from this project was approved for production in June 1990.

Work planned for FY 1991. Field evaluation time frames were extended at the request of a number of teacher evaluators. With the inclusion of time out of school for spring break and the complexity of testing a large number of activities, a time extension appeared a reasonable request. Project staff were more interested in receiving quality field reviews than on-time, but incomplete, evaluations. As each teacher evaluation is received, staff are recording and reviewing all comments and recommendations. When all reviews are received, the data will be posted, analyzed, and checked for accuracy. These data will then be used to determine all revisions made to the manual of activities as well as to the trays. Subsequently, revisions will be assigned to project staff and implemented. Following the completion of all revisions, the manual and trays will undergo two final expert reviews, from preschool vision experts who have had no input into the project development or evaluation process. Additional revisions may be identified through this process. Project staff will make final revisions and then incorporate all text on a formatted computer disk. Following final revisions, project staff will prepare production documents, and turn over the Hands On materials to production personnel. Project staff will work with production staff on producing a high quality manual and trays. In addition, project staff will write a final report detailing all aspects of project development.



## Early Childhood Microcomputer Applications (continuing)

**Purposes:** To familiarize staff with computer software designed for young children, to assess its applicability and/or adaptability for young blind and visually handicapped children, and to consider development of a talking software program for young blind children

**Project staff:** Sheri Moore, Project Director  
Microcomputer Group

**Background.** The increasing trend of working with young children and computers was discussed at the Fifth and Sixth Microcomputer Advisory Committee meetings. Specific to young blind children, it was determined that obtaining computer literacy early was a decided and necessary advantage. The advisory group recommended that APH staff should explore the use of computers with young totally blind children and, secondly, develop a beginning concept orientation talking software program for this specific audience.

**Work during FY 1990.** APH staff continued to keep abreast of the increased trends in microcomputer use with young children. Resource material and literature related to this specific topic were sourced and collected. Several pieces of early childhood software with possible application for young visually handicapped children were reviewed. Also, specialists in early childhood vision, with microcomputer experience, participated in the recent Microcomputer Advisory Committee meetings.

As a result of the deliberations at the Seventh Microcomputer Advisory Committee meeting, work on developing a talking software program for young blind children was postponed. The Committee discussed an array of projects related to the needs of blind students and microcomputer access, and determined that there were other areas of more pressing need for APH to expend its fiscal and staff resources. More specifically, a project to develop software with a high interest/low vocabulary emphasis received priority.

Consistent with the committee's interest in having APH staff continue to monitor and keep abreast of developments and trends in microcomputer use with young children, a number of site visits were made to local educational programs using microcomputers with young children, and APH staff attended local workshop highlighting the adaptive Firmware Card. A number of microcomputer programs were specifically targeted for review and observation, including the IBM Writing to Read series. Along with Writing to Read, the companion programs of Get Set (preschool level) and the new TLC program (2nd to 6th grade) were observed. The TLC program, produced by IBM, stands for teaching, learning, and computing.

**Work planned for FY 1991.** APH staff will continue to source and review literature, software, and peripherals related to microcomputer applications for young children with visual handicaps. Project staff will attempt to keep abreast of trends and developments for the specific groups of children targeted for this project. Because of concern for the lack of software useful



with young totally blind children, staff will continue to work with the Microcomputer Advisory Committee to determine if this area is high enough priority to warrant specific software development. If this becomes the case, a needs meeting will be conducted with several vision professionals using computers with young blind and visually handicapped children. This meeting would assist APH staff in determining concepts to be presented in the initial APH talking software program for early childhood learners. Following this meeting, specific software specifications would be developed.

Early Childhood References and Resources and Low Vision References and Resources (continuing)

**Purpose:** To research recent literature relevant to young blind and visually handicapped children and to develop a resource list of such references and resources; to research recent literature relevant to working with low vision individuals and to develop a resource list of such references and resources

**Project staff:** Sheri Moore, Project Director  
Karen Poppe, Project Assistant

Background. A selected bibliography of recent early childhood vision literature was prepared for the Printing House's 1987 Annual Meeting of ex officio trustees. At the same time, several other early childhood special education resource listings were also compiled and distributed including: professional journals, curricula, general references, and assessment tools. These resource materials have continued to generate considerable interest and requests from practitioners.

Work during FY 1990. Because of the continuing demand for these resource and reference materials, the selected bibliography of early childhood literature, specific to blind and visually handicapped children, has been refined and updated annually. The updated bibliography contains nearly 175 references, most being written in the past 7-8 years.

In addition, a second bibliography was researched and developed entitled Developing Visual Efficiency. This selected bibliography contains some 200 references relevant to the important topic of developing visual efficiency in low vision learners. These materials continue to be available as a service, upon request, to Printing House consumers. Staff has received a number of letters and phone calls commenting on the usefulness of these reference and resource lists. One state reported that it has sent copies to all vision professionals throughout the state.

Work planned for FY 1991. Project staff will continue updating both reference/resource lists on an annual basis. As before, both lists will be available at Annual Meeting or upon request at no charge.

Parents and Visually Impaired Infants (PAVII) (continuing)

Purpose: To provide written materials useful in developing individualized intervention programs for infants and young children with visual handicaps

Project staff: Sheri Moore, Project Director, APH  
Deborah Chen, PAVII Author  
Fred Otto, Editor  
Karen Poppe, Project Assistant and Editor  
Gail Cavello, PAVII Author  
Clare Taylor Friedman, PAVII Author

Background. The PAVII materials were developed through a federally funded project of the Blind Babies Foundation in San Francisco, California. Materials developed through the 3-year project are targeted for parents, early interventionists, and special educators providing home-based services to families with visually handicapped infants. There are six print booklets comprising project materials, each with several sections.

Following discussions between the PAVII director and APH staff, APH was requested to consider publishing the project materials. All PAVII materials were subsequently reviewed and evaluated by Printing House staff. The PAVII materials were then submitted to the Educational Research and Development Committee of ex officio trustees for publication consideration. At the June 1988 meeting of the Educational Research and Development Committee, approval was given to begin the evaluation, revision, editing, and publication process of the PAVII materials.

All PAVII materials were extensively reviewed by four content experts. Each reviewer completed a detailed evaluation of all PAVII components as well as a general, overall evaluation. The general evaluation assessed such things as PAVII's strengths and weaknesses, potential audiences and uses of the program, the value and usefulness of the materials, specific format and organizational recommendations, appropriateness of the illustrations, and reference and resource materials that should be added to PAVII. In addition, a great deal of detailed information was obtained for each of the sections, including section strengths and weaknesses as well as suggestions for improvement.

Work during FY 1990. PAVII is composed of six major sections, each with a number of subsections. These six components are listed and briefly described as follows:

1. The Parent Assessment of Needs (PAN). An ecological inventory or interview/report form which helps parents to identify home-based goals and prioritize objectives for their infants.
2. The Parent Observation Protocol (POP). An instrument for using a video "microteaching" format in parent-training. The format encourages parent observation of self and child, as well as identifies teaching priorities and strategies for facilitating early learning experiences.

3. PAVII "How-To" Papers on Assessment. This is a series of papers for home-based assessment of infants and toddlers who are visually impaired.
4. The Art of Home Visiting. A paper which discusses roles/responsibilities and prerequisite competencies for a home visitor. It also offers practical suggestions for a home visit and issues encountered in the home visit process.
5. Getting Ready for School. A paper for parents considering preschool programs for children with visual impairments. The paper discusses the learning environment, family factors, child factors, school district factors, expert input, and educational rights.
6. Learning Together: A Socially-based Curriculum for Infants and Toddlers with Visual Impairments is a parent guide of home-based strategies for daily routines which integrate cognitive, social, communication, motor, and perceptual skills. The guide includes a brief discussion about the parent's role as "teacher," the home as a primary learning environment, and suggestions for typical routines such as meal time, bath time, bedtime, play time, and going out.

Following the analysis of the data from the four content experts, decisions were made as to needed revisions and modifications of the PAVII materials. The list which follows is an overview of the activities of APH staff in producing the PAVII materials after receiving the evaluation of the content experts.

All data from expert reviewers' evaluations were posted and checked for accuracy.

Data were analyzed.

APH staff met with PAVII authors to review each suggested revision/modification.

Revisions were determined and finalized.

APH staff implemented all revisions to content.

PAVII authors reviewed all revisions for clarity and accuracy of content.

APH staff worked on illustrations for the various PAVII components.

APH staff completely formatted all PAVII materials, resulting in camera-ready copy to give to production.

APH staff completely edited all revised PAVII materials

PAVII authors reviewed illustrations and final formatted and edited materials.

APH staff conducted final proofreading of all materials



APH staff prepared camera-ready copy for production, using desktop publishing tools (to reduce costs to the consumer)

APH staff created design/layout/graphics for product

APH staff worked with any outside vendors, developing necessary specifications

APH staff developed a comprehensive production document, specifying all details of the various PAVII components

Project staff met with APH production staff to review production document and all production specifications

Meetings were held on a regular basis between project staff and production staff to insure accurate and timely publication of PAVII materials

APH staff communicated with PAVII authors about the status of the PAVII materials as they go through the production process

APH staff communicated with interested consumers on the status of the PAVII materials (via letter, phone call, or SpecialNet message)

Project staff worked with APH personnel responsible for writing/developing promotional material for PAVII

APH project staff reviewed initial production copies of PAVII materials for accuracy and clarity

APH staff compiled mailing list of all individuals who requested information from APH or PAVII project staff about the materials, and forwarded to APH marketing personnel

The PAVII materials completed the production process and were ready for sale in April 1990. All six major components are sold as a set; the Learning Together volume is also sold separately.

Work planned for FY 1991. Several activities remain before completion of the PAVII project. APH staff will write a comprehensive report of the development of the Parents and Visually Impaired Infants materials. Project staff will also likely conduct several workshops on the use and application of these new products. APH staff will also continue longterm monitoring of the PAVII materials content, and upgrade, improve, and revise as necessary. Personnel will reformat all PAVII materials, using a desktop publishing system, to make future changes inexpensively and quickly.

### Classroom Calendar Project (continuing)

Purpose: To develop a classroom calendar with both print and braille particularly for use with preschool and primary level visually handicapped children

Project staff: Eleanor Pester, Project Director  
Tom Poppe, Model and Pattern Maker

Background. During visits to both preschool and primary classrooms for the visually handicapped in May of 1988, both calendars and activities centered around them were observed. The calendar seemed to have the potential for being a useful educational tool, but required adaptation to be meaningful for both large type and braille readers. Some busy teachers did not take the time to adapt a calendar, and some of the calendars which teachers had adapted were rather unattractive. The solution seemed to be to develop a large type/braille calendar for classroom use. A market search was conducted to see calendars available for regular classroom use, and several sample calendars were obtained. Possible methods and materials for making the calendar were explored and a list of possible symbols was compiled. A prototype was developed and a planning document and time line were written. The project was presented to an in-house committee and discussed. Following the in-house committee meeting, questionnaires were developed and sent to nine reviewers. When all nine questionnaires were returned, data were analyzed, and objectives and suggested activities were compiled. Based on this information, recommendations were made for the production of (1) a classroom calendar similar to the prototype which had been developed, (2) individual monthly calendars with number large type/braille stickers, and (3) minor revisions in the present APH braille calendar. A report was written and distributed to the in-house committee for comment before proceeding.

Work during FY 1990. Prototypes of both the classroom calendar and the individual calendar have been prepared and placed in 10 sites for hands-on evaluation. Evaluations are expected back at APH by June 1.

Work planned for FY 1991. Data from the evaluations will be analyzed. The calendars will be revised for production as needed. Production specifications will be written and these calendars will be turned over to production. Specific suggestions will also be made for revising the present APH braille calendar to make it more useful for children in the primary grades and beyond.



Multihandicapped





Multihandicapped Adolescent Project (continuing)

Purposes: To develop a manual of community-based learning activities designed to meet the needs of adolescent multihandicapped visually impaired students, and to develop and evaluate several tangible materials useful in fostering independent functioning in adolescent multihandicapped students

Project staff: Sheri Moore, Project Director

Background. The Multihandicapped Adolescent Project is targeted for students who have achieved basic skill levels and are involved in an educational program emphasizing self-care, independence, and life/community living skills. Written activities include age-appropriate and environmental applications stressing skills useful in a community-based living option. Limited applications of functional academics are also incorporated into project activities.

Work during FY 1990. Project staff continued to keep abreast of literature, related literature and materials in the area of community-based instruction. Journal articles, media, curriculums, and books pertaining to sensory training, age-appropriate materials, the multihandicapped adolescent, daily living skills, community living skills, self-help skills, life skills, survival skills, group home living skills, functional programming, functional academics, and transition were sourced. Numerous activities have been written for the adolescent project. The majority of these activities have been formulated and designed by experienced teachers of multihandicapped, visually impaired adolescent level students. Activities cover a wide array of practical, functional program areas, and stress the importance of developing independence, self-sufficiency, and community living/life skills. The format for the presentation of the activities has been redesigned, with the objective of presenting information in a more concise and useful format. The revised format includes an overall rationale for using a functional curriculum, with an emphasis on practical activities that help students to generalize information. A main curricular area, such as community experience, is detailed, along with subtopics and specific activity suggestions in areas such as shopping, restaurants (fast food and sit down), and recreational/leisure activities. For each of these subtopical areas, further activity suggestions are given in areas such as functional reading and math; manipulative experiences; group/socialization applications; language/communication; sensory experiences; and extensions in areas such as cooking, art, music, dramatic play, etc. Examples of activities detailed under a functional curriculum for math are summarized as follows.

Math

counts numbers from 1-50  
labels coins, such as 5, 10, 25, cents  
labels bills  
combine/add coins to make change for  
soda machine or vending machine  
use coin matching sheets for vending  
machines

Language/communication

counts real items, such as silverware,  
plates, cups, party favors  
matches chairs to place settings  
matches plates to chairs

Group application (in community)

use money/ exchange specific amount  
when shopping  
gives money and waits for change  
carries money safely in purse or  
pocket

Work is continuing on refining activities. Project authors are also using the activities in their educational programs for multihandicapped visually impaired adolescent students to ascertain how well they can be implemented with the populations for which they were developed.

Work planned for FY 1991. Following refinement of the activities by the project authors, the complete set of materials comprising the Multihandicapped Adolescent Project will be field evaluated. Staff will work to make contacts with appropriate programs, and will secure any needed permissions to participate. Typically, staff will contact both program supervisors as well as classroom teachers who will be evaluating the materials on a daily basis. Project personnel will also construct an evaluation that will comprehensively address all aspects of the materials to be tested with the Multihandicapped Adolescent Project. Data from the evaluation will be posted, analyzed, and revisions will be determined. Preparations will then be made for the writing of a production document, prior to turning these materials over to the Production Department. Staff will continue to monitor the project through the production phases, and will also complete a final project report.

Task Oriented Inventory and Work Skills Program (Effective Use of Objects: A Process Centered Intervention) (continuing)

Purpose: To provide a program that will assess and include work skills activities for a process approach toward task oriented behavior with objects

Project staff: Bill Duckworth, Project Director  
Fred Otto, Project Assistant  
Suzette Wright, Project Assistant  
Gretchen Stone, Project Author

Background. The Austin Work Skills Evaluation, from the Texas School for the Blind, was found to offer a great deal of excellent material for programming with young visually handicapped students with developmental delays as well as the moderately to severely multihandicapped student. In working with the author, however, it was found that many of the ideas could be expanded and the program could include information for various populations of visually handicapped students. The program developed to be more nearly a process of concept development for the limited student or the student with limited experiences than it was a program that led directly to vocational training. With the wide range of the population needing prevocational training, it is natural that various professionals within this range were critical of doing a program for any one group of this population. This criticism was beneficial as it gave the project staff and the author other aspects to consider in revising the material. The program remains, however, a process of handling materials in a way leading to task-oriented behavior and the development of work-related concepts which will serve as a basis for more specific training.

Work during FY 1990. A major redesign of the format of the materials was made plus inclusion of refinements and explanations of many of the concepts. An experimental edition was distributed for field evaluation to nine sites in March 1990. Pending final revisions, the program was approved for production in June 1990.

Work planned for FY 1991. A final edition will be developed based upon the field evaluation and these materials prepared for production. A final report of the project will be written.





Low Vision



Potential Assessment of Visual Efficiency (continuing)

Purpose: To develop an assessment instrument useful in evaluating the potential for visual efficiency of young children with multiple impairments, in addition to a visual handicap

Project staff: Sheri Moore, Project Codirector  
M. Beth Langley, Project Author

Background. M. Beth Langley, author of the Functional Vision Inventory, has developed an instrument specifically designed to measure visual potential for visual efficiency in visually impaired multiply handicapped children. This instrument, entitled Potential Assessment of Visual Efficiency, contains a number of major sections outlined as follows:

- I. Demographics
- II. Physical readiness
  - A. Medication
  - B. Time of assessment
  - C. Seizure activity during assessment
  - D. Reaction to handling
  - E. Posture and movement components
- III. Vision structure and function
  - A. Structural status
  - B. Orientation and mobility
  - C. Functional use
  - D. Physiological status
- IV. Visual behaviors
  - A. Gaze
  - B. Eye movements
  - C. Visual fields
  - D. Cortical visual impairments status
  - E. Acuity
- V. Levels of stimuli and responses
  - A. Stimuli processed
  - B. Response patterns
- VI. Visual perception
- VII. Summary and impressions
  - A. Current level of visual functioning
  - B. Visual variables
  - C. Skills to be developed and/or refined

Work during FY 1990. An array of literature in several disciplines has continued to be sourced, surveyed, and integrated into the assessment. Journal articles were read and incorporated in disciplines including developmental medicine, child neurology, ophthalmology, pediatrics, brain research, pediatric ophthalmology, physiological psychology, psychology, low vision, developmental disabilities, and child development. In addition, a number of modifications and refinements were made to the instrument. Some of these major changes included:



1. Summary of visual responses section, with detailed lists of applicable items
2. Summary of acuity findings section, including responses to near point and far point, with consideration of methods used, size range, distance, and comments
3. Inclusion of an Individualized Functional Vision Service Plan
4. Quality of Environmental Interaction, included sections on Orientation and Mobility and Functional Use (mealtime, play, etc.)
5. Expansion of the Cortical Visual Impairment section
6. Development of visual perception and posture and movement components

In addition, the format has been modified and enhanced with the goal of making it easier to use and rate. A great deal of work has also been done in writing directions for use of the instrument. These directions are very comprehensive and detailed. A formative evaluation was conducted of the Potential Assessment of Visual Efficiency.

Work planned for FY 1991. Revisions to the instrument will be designed looking carefully at the results of the evaluation. In addition, the directions component of the Potential Assessment of Visual Efficiency will be modified and expanded, as dictated by field reviewers. Project staff are also considering the inclusion of pull out sections to the assessment, including specifically applicable components for special populations such as infants or multihandicapped students. Strong consideration will also be given to the inclusion of a materials component. An additional field evaluation will be arranged and conducted. Staff will make arrangements for this field evaluation and will also design needed evaluation forms. The results of this evaluation process will be used to revise and improve the Potential Assessment of Visual Efficiency.

Braille



Read Again: A Braille Program for Adventitiously Blinded Print Readers  
(continuing)

Purpose: To develop a set of materials designed to teach braille to persons who lose their vision after initially learning to read print

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Fred Otto, Assistant Editor  
Karen Poppe, Project Assistant

Background. A complete set of materials was designed to teach braille reading to persons who lose their vision after initially learning to read print. This set of materials was reviewed by the project's consulting committee. Pending revisions, the program was approved for production by APH's Publications Committee. Revisions of two of the beginning levels introducing braille letters, numbers, and basic punctuation were made and the levels were again reviewed by the committee. Following this meeting, these levels were once again revised to reflect the committee's suggestions, completing work on the part of the program dealing with Grade 1 Braille. Then the part of the program dealing with Grade 2 Braille was revised and new reading applications were selected, copyright permissions were secured, and some readiness materials of special relevance to the target population were written. The entire program was copyedited and content problems were cited. The research staff met together, reviewed the entire program, and made decisions about the problems that had been cited. Following this meeting, further copyediting was done based on decisions the group had made. Additional practice materials available from APH were referenced. Detailed specifications were written for braille and one copy was marked up for recording. Level A was brailled on plates and the decision was made to wait until the typesetting was completed before continuing with the braille and the recording. All levels were marked up for typesetting by Eddy Jo Bradley. The research staff worked with the typesetter to produce satisfactory galleys. The galleys for all the levels were dummied up, artwork was added, and front matter was completed. Proof copies of the entire program were returned from the typesetters and checked and double checked by the research staff.

Early in the project a survey of 200 adventitiously blind people learning braille was made to provide information for the development of the materials. An article describing the survey was written, submitted for publication, and rejected. A revised article on the survey of the adventitiously blind was submitted to another journal for publication consideration. Once again the article was returned with suggestions for additions and a request that the revised article be resubmitted for publication consideration. The article was revised and resubmitted.

Some progress was made on an article on the sequencing of the presentation of the braille code for adults. This included developing a tentative outline and a coding system suitable for publication and updating and adding to the information which had already been compiled.



Work during FY 1990. The research staff has continued to work closely with the production staff to prepare Read Again. Levels A and B were recorded. Levels B through I were brailled, proofed, corrected, and put on plates. Final corrections in the typesetting based on changes made during brailling are nearing completion. Notes have been gathered for the final report. The article on the survey of the adventitiously blind has once again been returned with suggestions for revisions and other sources for the publication of articles on rehabilitation are being explored.

Work planned for FY 1991. Read Again will be available in Fall 1990. A final report will be prepared.

Braille Language Program (continuing)

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Karen Poppe, Research Assistant  
Eddy Jo Bradley, Directing Editor  
Eric Hamp, Linguist

Background. This project was partially funded under a grant awarded to the APH by the Federal Research in Education of the Handicapped Program's Field Initiated Research competition which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, US Department of Education. The resulting product has been approved for production.

Work began on the project in January 1984. Information on achievement in language, spelling, and word study skills was obtained through administration by teachers of a special braille edition of the Stanford Achievement Test, Intermediate I, Form E to 57 blind 4th and 5th grade students to identify specific problems. Analyses were made of current spelling and English textbooks and of Patterns: The Primary Braille Reading Program. This information was used to develop the program.

The program consists of four levels, A through D. Each level of the program was drafted, reviewed, revised, and sent to pilot test sites for evaluation. Then the consulting committee met and reviewed the materials. Further revisions were made based on these evaluations.

These materials were then placed with over 50 students and approximately 20 teachers at field test sites across the country. Annual visits were made to the sites to explain the field evaluation procedures, check on progress, and observe the materials in use. Criterion-referenced tests were administered as the children completed each level. Test results were sent to APH for scoring and analysis.

Federal support for the project ceased December 31, 1989, at the end of the project's 5th year.

Work during FY 1990. Field testing of the materials continued with new materials sent to the field test sites as students were ready for them. Final, extensive revisions of the Level A text, Teacher's Edition, mastery test, and introductory materials based on the field evaluations were made in preparation for production.

Work planned for FY 1991. Field testing of the materials will continue. Since the majority of the students involved in the field testing were through Level B by the end of the 1989-90 school year, plans are to proceed with final revisions of Level B in preparation for production while beginning production of Level A and continuing field testing of Levels C and D.

## Grade 2 Braille Cards (continuing)

**Purpose:** To develop a set of cards with Grade 2 Braille units on one side and the Grade 2 Braille equivalent on the other side to be used with adventitiously blinded teenagers and adults who are learning braille or with younger braille readers who have been introduced to braille but need identification or spelling practice

**Project staff:** Eleanor Pester, Project Director

**Background.** This product was first conceived in 1987 when plans were underway to expand the Dolch Word Cards. Teachers of braille from both schools and rehabilitation centers who were questioned felt that such cards would be useful for their students. Grade 2 Braille Cards were approved for production at the annual meeting in October of 1987. No further research on this product was anticipated since the braille units themselves were set and a similar format to that for the Expanded Dolch Word Cards would be used. Work on this product was expected to begin soon after work on the Expanded Dolch Word Cards was completed. When specifications for production of the Grade 2 Braille Cards were being written, questions arose concerning what to include to make this product most useful. To get input from braille teachers to determine the final specifications for this product, a brief questionnaire was developed and sent to nine braille teachers with experience working with the target population. Information from the seven completed questionnaires was used to write the final specifications for this product.

**Work during FY 1990.** Although work on this product was complete, it ran into a snag in production. When the print sheets for the cards were being run through the braille presses, a copy of the cards was pulled and sent to the research staff for approval. Examination showed that a number of the dots on this copy were weak and some were squashed. This was attributed to the paper which seemed to be wearing out the braille plates even though it was the same kind that had been used previously for the Expanded Dolch Word Cards, but from a different producer. To remedy this situation, braille samples were produced on a number of different papers which were then judged to be acceptable or unacceptable and ranked for acceptability by four braille experts. Five hundred copies were made of the two most acceptable papers and copies #1 and #500 were compared for effects of plate wear by the same four experts. Both were judged to be generally acceptable, but there still seemed to be some problems where corrections had been made in the plate or where interpoint dots fell very close together.

**Work planned for FY 1991.** These problems will be remedied. The Expanded Dolch Cards will be run first and then the Grade 2 Braille Cards will be produced.



Braille Line Length Study (continuing)

Purpose: To compare reading speed and accuracy under three conditions--(1) paper with 40 cell lines, (2) paper with 20 cell lines, and (3) VersaBraille with 20 cell lines

Project staff: Eleanor Pester, Project Director  
Joe Petrosko, Design and Evaluation Specialist  
Karen Poppe, Project Assistant

Background. With the advent of paperless braille devices such as VersaBraille, the question of the optimum length for a braille display has arisen. At the present time, cost is a prohibiting factor, limiting the length of the display line. However, if a longer line was found to be sufficiently superior to the 20 cell line in general use, the increased cost might be justified. As technology and cost become less limiting factors, line length becomes an important question. Surprisingly, to date a review of the literature has turned up no research on this question.

A study comparing reading speed and accuracy of experienced adult VersaBraille users under the three conditions described in the purpose has been designed. Three passages of approximately 500 words each and of comparable difficulty and interest have been selected for this rate study. The Cloze Technique, how it relates to visually handicapped persons using braille, and the variation used in the reading rate test where subjects are asked to identify words that do not belong as they read were investigated and will be applied to the test material for a broad check of comprehension.

Before the test materials can be prepared, a survey will be conducted to determine whether participants use the older VersaBrailles which use cassettes or the newer ones which use disks and whether participants are familiar with the IRS code or with the newer BANA code. Telesensory Systems, Inc. has furnished a list of VersaBraille users who are being surveyed and from which the subjects for this study are expected to be selected.

Work during FY 1990. A questionnaire has been prepared in both braille and print and sent to VersaBraille users in five states. Responses have been very slow coming back to APH.

Work planned for FY 1991. VersaBraille users who have responded to the survey will be sent letters thanking them for their help with this project and explaining the delay in the testing; VersaBraille users in the five states who have not responded will be recontacted about possible participation. As soon as a sufficient number of responses are in, data from the survey will be analyzed. Test materials will be prepared based on the results. Participants will be contacted and testing scheduled. The goal is to have 24-36 subjects. If the goal is met and the project is feasible, data will be collected and analyzed. A final report and an article will be written.

Linguistic Analysis of American Literary Braille, Grade 2 (continuing)

Purpose: To conduct a thorough and systematic linguistic analysis of American Literary Braille, Grade 2, which will incorporate the new braille terms developed for Patterns: The Primary Braille Reading Program

Project staff: Hilda Caton, Project Director  
Eric Hamp, Linguist  
Karen Poppe, Project Assistant  
John Siems, Data Analyst and Computer Programmer, APH

Background. No systematic analysis of American Literary Braille has been conducted. The British have completed a major contraction study of their system which includes frequency of occurrence of braille contractions in written text. That study, however, did not consider a grouping of braille configurations (contractions) which was different from the groupings now in use. This linguist analysis of American Literary Braille is somewhat similar to the British study except that it uses the new terms (groupings) used in the braille reading and language programs developed at APH and will extend the analyses to areas not included in the British study. The basic plan included the following steps:

1. Selection of appropriate text materials for the analysis
2. Marking (or bracketing) of the braille configurations defined in Patterns: The Primary Braille Reading Program
3. Counts of the frequency and order of occurrence of those elements in the text materials
4. Revision of the order and groupings of braille rules in the publication English Braille: American Edition 2 with an emphasis on more effective orders and groups for teaching purposes
5. Publication of various types of materials to assist in the teaching and learning of braille

The text materials have been selected and the analysis has begun. The text materials for the analysis consists of 25 samples from the corpus which forms the basis of the publication, Computational Analysis of Present-Day American English (Kucera, H., & Francis, W. N., 1967), generally known as the Brown Corpus. This publication contains 1,014,000 words and consists of 500 samples each of about 2,000 words, taken from contemporary publications in American English. The 25 samples used in the analysis are representative of all types of literature in the Brown Corpus.

Work during FY 1990. The computer translation of the selected samples of the Brown Corpus was completed, printed, and proofed. The line by line marking and counting of all braille units, contractions, composition signs, punctuation, and numbers (alphabetic and numeric) continued and some preliminary results were tabulated. It was not possible to complete other analyses which were originally planned for this year because of a delay in obtaining the Brown Corpus and completing the braille translation of the selected samples.

Work planned for FY 1991. The marking and counting of various types of braille units will continue (i.e., the frequency of occurrence of certain braille units which occur in several different forms depending upon where they occur in a line, next to punctuation, etc.). Further analyses will be made of the braille units already identified and a report will be written describing the completed part of the analyses and the implications for teaching and learning of the braille code.



## Adult Braille Writing Program (continuing)

Purpose: To develop an instructional braille writing program for adults with both slate and stylus and braillewriter components

Project staff: Hilda Caton, Project Codirector  
Eleanor Pester, Project Codirector  
Eddy Jo Bradley, Materials Developer  
Betty Wommack, Materials Developer

Background. To provide a truly comprehensive program in braille instruction for adults, it is necessary to teach students how to write as well as how to read braille. There is very little research available on braille writing for either children or adults. A survey done by Lowenfeld, Abel, and Hatlen (1969) reported that braille writing was usually introduced to children at the same time as braille reading and that the braillewriter was usually used to teach braille writing. No other research is available on braille writing instruction. This includes research on the use of the braillewriter and the slate and stylus for children or adults.

From the time planning for Patterns: The Primary Braille Reading Program and Read Again: A Braille Program for Adventitiously Blinded Print Readers began, the need for formal braille writing instruction was recognized. An introduction to the use of the braillewriter for children was written as part of the Braille Language Program. This could be revised for use by adults. Also, during the past few years several slate and stylus programs for children and adults have been developed. A review of these showed that a program by Betty Wommack most closely corresponds to the philosophy of slate and stylus instruction which has been developed at APH. Betty Wommack has been contacted and is willing to assist in preparing this program for adults. The completed program would consist of a braillewriter and slate and stylus program.

Work during FY 1990. No work was initiated.

Work planned for FY 1991. Specifications for this program will be determined. A draft copy of the program will be developed and copies prepared for review. The data from the reviews will be analyzed and revisions made as necessary.



New Programmed Instruction in Braille (discontinued)

Purpose: To review a new edition of Programmed Instruction in Braille (Ashcroft & Henderson, 1963) and prepare it for production by the American Printing House for the Blind

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
LaRhea Sanford, Project Coauthor  
Sam Ashcroft, Project Coauthor

Background. The original publication of Programmed Instruction in Braille (Ashcroft & Henderson, 1963) was widely used in teacher preparation programs throughout the United States. The publication of the book was discontinued because the publisher went out of business. Since then, there has not been a textbook which was totally adequate for the instruction of future teachers (or others) in learning the literary braille code. However, Programmed Instruction in Braille has now been revised by Sam Ashcroft and LaRhea Sanford and considered for publication by the American Printing House for the Blind. A meeting of the project staff was held at the American Printing House for the Blind to discuss the procedures and considerations for publication by APH.

Work during FY 1990. The revised version of New Programmed Instruction in Braille was sent to three persons in the field who are highly knowledgeable of the literary braille code or experienced in the teaching of it for review. Results indicated major revisions were needed. As the authors indicated a lack of interest in doing so, the project has been discontinued.

Development of Guidelines for Literacy: Selecting Appropriate Learning Media for Visually Handicapped Students (new)

Purpose: To develop a set of guidelines/criteria to assist teachers in selecting the primary reading medium or media for visually handicapped students with some remaining vision

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Project Associate Director  
Karen Poppe, Project Assistant

Background. At the present time, a great deal of attention is being given to the overall question of developing braille literacy in visually handicapped children. Specifically, many persons working in the field of the education of visually handicapped children feel that many of these children are not receiving adequate (or any) instruction in braille and are, therefore, not becoming literate braille readers. In particular, it appears that many children who have some remaining vision are not being provided the opportunity to learn braille.

APH's Educational Research and Development Committee requested APH bring together national experts in this area to develop a set of guidelines, or criteria, to assist teachers in determining which children should use braille as their primary learning medium. Also, the guidelines will address when the instruction in braille for children with degenerative eye conditions should begin.

Work during FY 1990. A committee meeting was held at APH on June 8-9, 1990, to develop the guidelines. The members of the committee are:

Mr. Norman Anderson, Teacher, Maryland School for the Blind  
Dr. Natalie Barraga, Professor Emeritus, University of Texas  
Mr. Charles B. Boyer, Member of the APH Educational Research and Development Committee and Superintendent of the California School for the Blind  
Mr. John di Francesco, President of the Braille Revival League of the American Council for the Blind  
Sr. Margaret Fleming, Teacher of the visually handicapped, St. Lucy's Day School, Philadelphia, Pennsylvania  
Dr. Randall Jose, Optometrist, Tulsa, Oklahoma  
Dr. Sally Mangold, Professor, San Francisco State University  
Mrs. Suzi McDonald, Preschool Teacher, Arizona School for the Blind and the Foundation for Blind Children, Phoenix, Arizona  
Mr. Fred Schroeder, Board of Directors, National Federation of the Blind  
Dr. Evelyn Rex, Professor, Illinois State University, Normal, Illinois  
Dr. Susan Spungin, Associate Executive Director, American Foundation for the Blind

A decision was made to write and publish the set of guidelines if a consensus was reached at the meeting and, if no consensus was reached, a detailed report of the meeting would be published.

Work planned for FY 1991. The work for FY 1991 will consist of the final writing and publication of the guidelines or report of the meeting.

Braille Needs Meeting (new)

Purpose: To determine priorities for future research and product development in braille

Project staff: Hilda Caton, Project Codirector  
Eleanor Pester, Project Codirector

Background. Since many of the braille research and development projects being conducted by the Department of Educational and Technical Research are nearing completion, it is necessary to begin planning for future projects. There are many research needs in this area and, in order, to meet the most critical needs it is desirable to form a committee of persons who are working directly with children and adults, who use braille as their learning medium, to determine priorities for future projects.

Work planned for FY 1991. A committee of 10 people will be formed and a meeting scheduled at APH to identify and to determine priorities for needs in both braille research and materials development. The recommendations from this committee will be used to plan for future work in this area.

#### Educational Measures





Assessment of Braille Skills (new)

Purpose: To develop, or adapt, a test or tests that will assess the braille skills of school age students and adults seeking employment

Project staff: Bill Duckworth, Project Codirector  
Hilda Caton, Project Codirector

Background. APH's Educational Research and Development Committee requested APH develop, or adapt, an instrument that could be used to assess the braille skills of blind students and adults, with particular attention being given to its use for employment purposes.

Work during FY 1990. Preliminary work done during this period included in-house discussion of possibilities, the collection of catalogs listing such tests, and contacts with various test publishers.

Work planned for FY 1991. Specifications for this test, or tests, will be developed. These will be a topic for consideration as general test needs are identified (see "New Educational Measures Identification") and at the planned "Braille Needs Meeting."

Brigance Diagnostic Inventory of Early Development (yellow) (continuing)

Purpose: To provide a tactile supplement to this Inventory for blind children ages infancy through 7

Project staff: Bill Duckworth, Project Director  
Josephine Stratton, Research Intern (formerly)

Background. This Inventory is being revised by its publisher. A new edition is expected in 1991. The publisher has said most of the competencies will remain in the same order with much of the material remaining intact.

The adaptation of format has been done on the current edition. All activities have been assigned a label as to what steps the teacher will take in assessment such as using the supplement, using the print edition with modification, etc. One section, General Knowledge and Comprehension, was completed and evaluated to determine if the format was appropriate. However, a decision was made to put the project on hold until the new edition is released in order that the supplement from APH be for use with the newer edition. The Inventory was approved for production by APH's Publications Committee.

Work during FY 1990. No work was done on this project pending publisher revision. Curriculum Associates notified APH that the plans to revise this inventory have been delayed.

Work planned for FY 1991. Adaptation will be completed when the revision is published. Curriculum Associates has indicated that draft sections will be forwarded to APH as revision takes plan.

Computer Administration of Academic Measures (discontinued)

Purpose: To investigate the possibilities of using microcomputers to administer academic measures

Project staff: Bill Duckworth, Project Director

Background. For ease of administration, scoring, and record keeping, it seems quite plausible that some types of academic tests could be placed on computer disks for use by students who use braille and large type. The braille user would use the voice synthesizer along with braille and graphics where needed. Problems of doing this for the large type user have yet to be identified other than the need to change the format for placement of large type on the screen. Tests presently offered on computer were examined. Most were found to be not academic, but personality, occupational preference, etc.

Testwriter from Micro Media Publishing was found to have all the components that were felt to be important in administering an academic test on a computer. Test items from the Stanford Achievement Series were placed on the disk. The administration allowed a review of a question but changing mode was complicated. It also allowed storage of the students incorrect answers on the disk. Many markings which are used in pencil and paper tests and in braille tests had to be changed to be read on the screen. This is especially true for large type users. Several adults took the test and it was found that the test was a greater indicator of the person's expertise with a computer/synthesizer than it was of the knowledge of the material being tested.

Work during FY 1990. Various programs have been inspected but few will give an honest evaluation of a student's knowledge of subject matter. Most are a more reliable evaluation of competence in using a computer than on knowledge within a testing area. Few programs, so far investigated, allow the student to review material with ease.

Work planned for FY 1991. While an interest will remain and an investigation will continue informally, this formal investigation is to be put on hold as to the possibility of comparing performance of a student on a braille administered form of a subtest to his/her performance on a computer administered form of a subtest.



Stanford Achievement Test, Form J of Series 8 (completed)

Purpose: To adapt into braille and large type one form of the latest edition of the nation's most widely used achievement series

Project staff: Bill Duckworth, Project Director

Background. Continued contact with The Psychological Corporation, the publisher of the Stanford Achievement Series, obtained for APH the opportunity to be involved in the planning stages of the Stanford Achievement Test, Series 8. The series looks promising in that APH has had input into the item selection. Additionally, The Psychological Corporation has volunteered to renorm any subtest from which it is necessary to omit items in the braille edition. This edition is unique in that each level of the test is for one grade level only. The levels to be modified begin with 2.5 to 3.5. This presents APH with the possibility of offering only one form of the test. Psychological Corporation sent APH the item pool for the Stanford Achievement Test, Series 8. All test items that would pose a problem for the braille edition were flagged. Whenever possible, The Psychological Corporation avoided using these items in the final item selection for the series. This process seems to have been effective. In the Primary 2 level of Form J, only one subtest (Environment) had to be dropped and 6 questions from another of the subtests. This is in comparison to two entire subtests and 12 questions dropped from the braille edition of this level in Series 7. Form J (Series 8) was approved for production by APH's Educational Research and Development Committee.

Work during FY 1990. Ten levels, each, of Form J of the Stanford, Series 8, were adapted into braille and large type with eight accompanying sets of Directions for Administering for each media. The series was offered for sale in March 1990.

New Educational Measures Identification (new)

Purpose: To identify widely used academic tests for which braille and/or large type editions are needed

Project staff: Bill Duckworth, Project Director

Background. Since the 1920s, APH has provided academic tests for use by the population it serves. Efforts are made to provide those tests most commonly used throughout the country.

Initially a mail survey will be conducted to obtain the names of specific tests that are commonly used and needed. After this, a needs group will be gathered to discuss the results, review specific tests, and determine general areas of need. Emphasis will be placed on tests that measure those skills needed on the job. Specific tests will be identified and priorities determined for their adaptation.



Microcomputer Applications

Process and Information Dissemination





Seventh Microcomputer Advisory Committee Meeting (series)

- Purpose: (1) To identify and prioritize needs for educational materials to support use of microcomputers  
(2) To discuss and make recommendations regarding important technology-related considerations

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Project Assistant

Background. An advisory group was formed in 1984 to provide specific information and guidance on a continuing basis in the area of technological needs and applications. Six microcomputer needs meetings were held with the advisory group at APH. They were in August 1984, March 1985, October 1985, September 1986, September 1987, and September 1988.

Work during FY 1990. The Seventh Microcomputer Advisory Meeting was held September 28-29, 1989. The greatest needs (in order of priority) identified at this meeting were:

1. APH PocketBraille:
  - a. correct random loss of data
  - b. add file structure
  - c. improve editor
  - d. add cut and paste
  - e. improve search and replace
2. Market Talking Typer
3. Market TEXTALKER GS
4. Market LetterTALK+
5. Use an existing program like Easy Pilot from Hartley to develop talking and large print drill and practice math programs to include addition, subtraction, multiplication, division, decimals, fractions, percentages, grouping and regrouping.
6. Market portable talking hand-held scientific calculator with earphone jack
7. Develop high-interest low-vocabulary age-appropriate programs for developmentally delayed students junior high and above. Investigate authoring languages and already existing programs (e.g., basic concepts and age-appropriate functional life skills).
8. Write an article to be published in Micro Materials Update relating to telecommunications.
9. Continue development of World Book CD-ROM version.

10. Continue development of AppleWorks Tutorial Manual and AppleWorks Reference Manual on disk
11. Market Speaqualizer MC and incorporate DoubleTalk speech on both Speaqualizer versions
12. Conduct a feasibility study of a Spanish Speaqualizer and present this study to the Microcomputer Advisory Committee and to APH's Research and Development Committee
13. Continue investigating early childhood applications of computer technology and consider this a future priority area

The Seventh Microcomputer Advisory Committee gave a higher priority to adapting or developing high-interest low-vocabulary programs rather than early childhood computer programs. Plans for an early childhood needs meeting were changed to planning a meeting for identifying and targeting specific high-interest low-vocabulary age-appropriate programs needed for developmentally delayed blind students junior high and above. (See the write-up on "High Interest Low Vocabulary Age Appropriate Software Needs Meeting" for the results of the meeting.)

The only of the above priorities not being addressed by APH is #6. The National Federation of the Blind is developing a talking hand-held scientific calculator projected to cost about \$200.00 when completed. A talking hand-held calculator that performs the four basic functions (+, -, x, ÷) is available for a nominal fee from BIT Corporation.

Work planned for FY 1991. An eighth meeting of the Microcomputer Advisory Committee will be conducted to review progress, share information, discuss current priorities, project future activities, and reprioritize the needs in this area. A subcommittee meeting on a "new" high priority area will be planned and conducted as a result of the needs determined during the Eighth Microcomputer Advisory Meeting.

High Interest Low Vocabulary Age Appropriate Software Needs Meeting (new)

Purpose: To identify and prioritize needs for high interest low vocabulary age appropriate materials to support use of microcomputers

Project staff: Debbie Willis, Project Director  
Venus Elder, Project Assistant

Background. The Seventh Microcomputer Advisory Committee gave high priority to adapting or developing high interest low vocabulary age appropriate software for developmentally delayed blind students junior high and above.

Work during FY 1990. In preparation for the meeting, appropriate participants were identified and an annotated high interest low vocabulary bibliography was compiled. The "High Interest Low Vocabulary Age Appropriate Software Needs Meeting" was held in Louisville Kentucky on June 5, 1990. There were three major priority areas identified at this meeting: (a) Daily Living Skills, (b) Study Skills, and (c) Job-Seeking Skills.

According to the participants, computer-related activities within each of the three major priority areas should be related to reading, writing, and math.

The target audience identified by the committee was: Totally blind, marginally academic students, junior high and above, who are behind in reading and math (for a variety of reasons), and are reading at a fourth-fifth grade level.

Top priority for Daily Living Skills was given to handling money, money identification, making change, and budgeting. The committee felt including word problems as a part of the activities is important.

The top priorities determined for Study Skills were (a) outlining, (b) determining important facts, (c) notetaking, and (d) writing papers.

The priority for Job-Seeking Skills determined by the committee was to focus on career exploration and interest assessment.

The committee further recommended that the Micro Group plan on software being used as a supplement to class or by an itinerant teacher or in a resource room. The software should be reinforced with braille, large type, and/or audio materials for student use.

The committee also recommended that if APH develops these programs from scratch, a programming language should be used which allows the software to work on IBM and Apple II computers. If this cannot be done or if programs are being adapted rather than developed, make the Daily Living Skills software and Study Skills software usable on Apple II computers; the Job-Seeking Skills software usable on IBM computers.



Software recommendations from the committee included the following:

1. try to make the software and support materials clear and easy to use
2. be consistent about features on the screen and operation of the program
3. wherever possible, incorporate fun and game activities that teach
4. try to make the software usable independently by the students
5. incorporate record-keeping systems so students can turn in records of results to classroom teachers
6. use language that is enjoyable to the students
7. use high interest examples (going to the mall, making friends, going on a picnic, listening to music, playing a musical instrument, dating, parties, playing cards and games, sports, special events)
8. integrate music, sound effects, graphics (for low vision students)

The committee recommended that the Micro Group initially create or adapt a single software selection with support materials in each of the three major areas of Daily Living Skills, Study Skills, and Job-Seeking Skills in the order listed.

Work planned for FY 1991. A variety of materials dealing with handling money, money identification, making change, and budgeting will be reviewed. A talking software program will then be designed and work on programming will begin.

Monitoring Technological Developments (formerly entitled Survey of Products Being Used and Products in Need of Development for Legally Blind Persons Using Microcomputers) (continuing)

Purpose: To determine the greatest unmet needs of the field and set priorities appropriately by gathering information on the current "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons

Project staff: Debbie Willis, Project Codirector  
Larry Skutchan, Project Codirector

Background. When APH became interested in developing microcomputer related products in the summer of 1983, it was necessary to determine the greatest needs of the field and set priorities appropriately. Information regarding the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually handicapped persons was gathered during the fall and winter of that year. Recognizing, however, that this is a rapidly changing field, a second survey was conducted in the winter and spring of 1986. These two surveys provided valuable information for planning and decision-making purposes.

Work during FY 1990. Trends and changes in the computer industry and in education have been monitored through reviewing literature; attending conferences and exhibits; and talking with vision teachers, computer resource personnel, rehabilitation specialists, software and hardware developers, vendors, blind computer users, and others. With these sources of information available, it has not been necessary to conduct another major survey. Brief surveys and subcommittee meetings are proposed as the need arises.

Work planned for FY 1991. Trends, changes, and needs will continue to be monitored as they were in FY 1990.

Observation and Information Dissemination (continuing)

Purpose: To gain insight into user problems by observing students at the computer and to disseminate information on current uses of technological aids through workshops, presentations, and other means

Project staff: Microcomputer Group

Background. The Fourth Microcomputer Advisory Committee recommended the microcomputer group help disseminate information about relevant technology to the field. Additionally, the meeting of the interim committee in May 1985 resulted in a strong recommendation that the microcomputer group observe students using APH computer products. To this end, the microcomputer group conducted the summer workshops in June 1986, presented microcomputer materials at several conferences, and observed students on a weekly basis at the Kentucky School for the Blind.

Work during FY 1990. The microcomputer group along with members of APH's Department of Educational and Advisory Services continued presenting and demonstrating APH microcomputer materials at relevant conferences. Interested students, teachers, and computer users that visited APH also received detailed product information and demonstrations upon request.

In addition, several members of the Microcomputer Group have observed students of varying ages using a variety of software. Interested users and potential consumers' questions concerning computer software and hardware products continue to be answered.

Furthermore, an annotated bibliography on technology-related topics from 1980-88 for visually handicapped persons was updated to include relevant information from 1986 to early 1990. The bibliography was made available free of charge on 5 1/4" disks formatted for Apple II computers. The bibliography consists of two AppleWorks files: annotated file (wordprocessor) and initial information file (database).

Student observation, or information gathering, was conducted concerning technological aids and software. These included:

1. The Disabled Citizens Computer Center--special education software, assistive devices, and adaptive firmware card.
2. IBM's TLC (Teaching and Learning with Computers) 2nd-6th grades: reading, language arts, and math
3. IBM's "Get Set" (4 year old prereading program) and "Writing to Read" (K-1 Whole Language Reading program)
4. IBM's PALS program (Principle of Alphabet Literacy System) Adult Literacy

5. IBM presentation of assistive devices, software, and the National Support Center for Persons with Disabilities
6. Assistive Devices and Special Education Software: Kentucky School for the Blind and Churchill Park School
7. Sending for information concerning the following topics: early childhood and microcomputers, math programs, and high-interest, low-vocabulary materials
8. Street Electronics updated listing of ECHO compatible programs
9. Adhoc Reading Systems demonstration: Kentucky School for the Blind
10. Public school students (second grade) working in computer lab using MECC and Sunburst programs: Price Elementary School
11. A member of the Microcomputer Group offered a course called "Basic Computer Programming" at the Kentucky School for the Blind.

Work planned for FY 1991. The Microcomputer Group plans to continue with presentations and demonstrations of APH's computer-related products and the observation of computer users of all ages whenever possible. The bibliography will be updated and made available again this fiscal year.

The Microcomputer Group will also continue to keep up-to-date concerning software programs and assistive devices for the visually impaired. Especially pertinent information will continue to be included in APH's Micro Materials Update in the "News, Views, and Muse" section.



Product Evaluation (continuing)

Purpose: To evaluate user satisfaction with APH microcomputer products, to monitor and improve project planning and management, and to continue the identification of users of APH microcomputer materials

Project staff: Debbie Willis, Project Director  
Venus Elder, Project Assistant  
Karen Poppe, Project Assistant

Background. From the first software product published by APH, all microcomputer materials have included a self-addressed, postage-paid "User Survey Card" which asked for information which would identify the consumer, product, setting in which the product is used, strong and weak points of the product, suggestions for improvement, current equipment accessible to the user, number of users and their age/grade range, and additional comments. As an assessment instrument for evaluation, these cards provide a valuable source of information which aid in the decision-making process of the staff involved with improving existing products, determining future needs and projects, and monitoring trends in these categories. These cards also serve as a vehicle for identifying users of APH microcomputer material which is useful in finding reviewers of products and potential participants in microcomputer advisory meetings. Results of the entered data were reported at the Fifth Microcomputer Advisory Committee Meeting. Consumers' names and addresses have been entered in a separate database to receive copies of the Micro Materials Update.

Work during FY 1990. The information received through August 1989 was printed out during the planning stage of the Seventh Microcomputer Advisory Meeting to see if any pattern in requests was occurring. While there was not a great deal of consensus, the most frequently occurring requests were for talking educational games, how to make their own software talk, switch-activated software, and software for very young blind children.

As a result of these requests, articles on talking Eamon adventure games appropriate for junior high students and above available through the Communicator Apple Users Group, talking software and single-switch software for a wide range of ability levels including some appropriate for very young and multihandicapped available from Dick Upton at the Arizona State School for the Deaf and the Blind, an article on public domain software libraries with talking software, articles on making your own software talk, and a write-up on APH's new Talking Utilities for DOS 3.3 which includes a program to automatically install speech on a disk, were written and included in the 1989 winter or summer issues of the Micro Materials Update.

Complete information from all the User Survey Cards received during this fiscal year was entered into a database. Needs expressed by users on the User Survey Cards were cataloged and placed into various categories. A report highlighting areas which were sighted most often was presented at the June 1990 meeting of APH's Educational Research and Development Committee. The top four categories in order of greatest need expressed were (a) math (early upper level), (b) educational games, (c) word processing, and (d) language arts.

Requests for information and difficulties with software were addressed. Consumers' suggestions for future software projects were shared with members of the Microcomputer Group. Suggestions or comments on the cards are taken into consideration when the products are revised and in the adaptation or development of new products.

Names and addresses of new consumers continued to be entered in the database of those who are to receive copies of the Micro Materials Update.

During the 1990 Kentucky Educational Technology Conference in Louisville many people who stopped by the APH booth expressed the following need: Leisure/enjoyment and/or recreational software for visually impaired and/or multihandicapped elderly persons.

Work planned for FY 1991. The information from the User Survey Cards will continue to be entered into a database. The data will be analyzed periodically to study trends, revise current products, and assist in future planning. Names and addresses of new consumers will continue to be entered in the database used as a mailing list for the Micro Materials Update.

Information Dissemination: Micro Materials Update--newsletter (continuing)

Purpose: To provide a description of completed APH microcomputer materials development projects and other relevant resources for computer products and information to serve as a (a) newsletter for professionals in the field, (b) convenient means of responding to requests for more information, and (c) handout to distribute at appropriate presentations/workshops/exhibits

Project staff: Microcomputer Group

Background. The first Micro Materials Update was generated specifically for the purpose of serving as a handout for a teacher inservice presentation made by APH staff in November 1985. The same year the Microcomputer Advisory Committee recommended adding a column that would include information, in this field, that was being pursued outside of APH. The title of the column became known as "News, Views, and Muse."

Responsibility for the Update was divided between research and marketing staffs. Research was responsible for the content of the newsletter, maintaining the database of addresses, and for providing an address label printout for mailing. The newsletter was made available in braille and print forms.

The mailing list continued to grow, giving APH valuable resource of persons who are buying and using APH software and related products. For the Summer 1989 issue, 4,400 copies were necessary to keep pace with request for more information.

The Micro Materials Update was updated and disseminated in print and braille twice during FY 1989. Both research and marketing contributed articles. The database of readers continued to be maintained. The Update has continued to be provided as a handout at numerous presentations, workshops, and exhibits. It has also served as a quick and valuable response to numerous phone calls and letters regarding APH's computer products.

Work during FY 1990. The Summer 1989 Micro Materials Update and the Winter 1990 issue were written, as usual containing articles by both research and customer support staff. The first part of an in-depth series on telecommunications made up the lead story in the Winter 1990 issue; this series was requested by the Seventh Microcomputer Advisory Committee. The pattern of listing all APH computer-related publications and technological products in the Winter issue was continued.

The decision was made to publish the newsletter in large type and cassette instead of large type and braille. This choice will be assessed as responses from readers come in.

Work planned for FY 1991. Summer 1990 and Winter 1991 issues of the Micro Materials Update will be published. The Microcomputer Group will retain responsibility for authorship and editing, but anticipates turning over the formatting and production responsibilities to the customer support personnel in APH's Department of Educational and Advisory Services.

Microcomputer Applications  
Products





APH PocketBraille (continuing)

Purpose: To develop and refine a portable note-taking device

Project staff: Larry Skutchan, Project Director  
Fred Otto, Project Assistant  
Jim Robinson, Manufacturing Specialist

Background. The Kentucky Department for the Blind developed the PocketBraille and PortaBraille. Each is a complete portable note-taking system with braille keyboard, parallel and serial ports, and a speech synthesizer. The PortaBraille additionally contains a braille display. Each contains firmware that makes writing and editing possible. With the approval of its Educational Research and Development Committee, APH began designing a version of this system. It is called the APH PocketBraille. The APH PocketBraille was first marketed in June 1988. Since then, one revision was made and released. It corrects some bugs in the original system, improves speech quality and responsiveness, and compensates for differences in a part that is no longer available in the United States.

Work during FY 1990. Work on a new editing and operating system that supports user selectable file names and sizes was begun. The Apple Screen Door support was discontinued due to trouble getting the board manufactured and to the lesser need for such a product in light of new developments with the TEXTALKER program. The IBM Screen Door portion of this project was also dropped. The room required for support of the product in the APH PocketBraille's ROM is currently not available. A new manual was written that removes all obsolete topics and presents the material in a meaningful way. It was sent to all PocketBraille customers.

Work planned for 1991. Work on the new editor and operating system should be completed during the 1991 fiscal year.

APH Scientific Calculator: for the Apple II Computer (continuing)

Purpose: To produce a talking calculator program

Project staff: Larry Skutchan, Systems Programmer

Background. Members of both the Third and Fourth Microcomputer Advisory Committee Meetings noted the need for a sophisticated, inexpensive calculator program. Such a program was discovered on the CompuServe network, the author was contacted, and permission to adapt the program was obtained. It was called Number Cruncher. Production approval for this product has been obtained and the product was turned over to production.

Work during FY 1990. After the product was turned over to production, problems were discovered with the recording of the user manual and with the braille reference sheet. These problems were resolved.

Work planned for FY 1991. This project is complete. Future enhancements will be dictated by responses from the field.

communications system called "Book Manager." The user, however, pays a fee comparable to the cost of the printed manual plus the on-line cost.

Work during FY 1990. The disk version of the Apple IIGS Owner's Guide and the introduction to be provided in braille and large type were reviewed. After the necessary changes were made, the Apple IIGS Owner's Guide: Disk Edition was turned over to production. This product is available. Copies of the finished product were sent to Joe Williams and Eileen Blair at Apple, two people who helped secure permission for the project.

After protracted correspondence with Claris Corporation, APH received permission to publish the Appleworks Reference Manual and AppleWorks Tutorial on disk. Project staff had to devise language for the license agreement which would satisfy Claris' concern over use of the disks by people who are not visually handicapped. After this was resolved, Claris sent the manuals on PageMaker disks. These two books have been given priority over the Apple IIc+ Owner's Guide and the Apple IIe Technical Reference for which APH has the disks, but which have lost some of their initial appeal as projects.

Work planned for FY 1991. The two AppleWorks manuals will be edited and produced in the same manner as the Apple IIGS Owner's Guide. Production of more manuals on disk will be weighed against other department priorities, timeliness of the materials, and sales of the first products.



MECC Software (continuing)

Purpose: To adapt widely used educational software distributed by the Minnesota Educational Computing Corporation (MECC)

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Venus Elder, Project Assistant

Background. Participants in the Second, Third, Fourth, Fifth, and Sixth Microcomputer Advisory Committee Meetings and members of the Educational Research and Development Committee at APH's 1986 Interim Meeting and 1988 Annual Meeting assigned high-priority status to the development of speech-adapted software from MECC. This challenge is particularly noteworthy because MECC materials are developed by educators and include a vast collection of titles already available to thousands of school systems nationwide.

General approval for production of speech accessible adaptations of the MECC software was granted with the following priorities: 1. mathematics, 2. science and simple logic, and 3. English, social studies, and writing.

After completing the talking version of Elementary Volume 1--Mathematics, permission was sought and received from MECC to modify three additional selections. They are Food Facts, Elementary Volume 5--Language Arts (Prefixes), and Social Studies Volume 1.

During FY 1989, final modifications were made to the talking version of Food Facts. The supplement, to accompany the talking disk and original MECC manual, was completed. After consultants evaluated Food Facts, and a final in-house review was conducted, the modified version was submitted to MECC for final approval and then turned over to production. This program became available during FY 1989.

Elementary Volume 5--Language Arts (Prefixes) was completely reworked in order to operate more quickly, to keep student records, and to set up each file so that the teacher will be able to alter the files in any way desired. The puzzles on the disk were also improved and the question/answer choices were randomized to provide greater use of the program for each student. The program was reviewed several times in-house and by outside consultants. Many "bugs" in the program needed to be worked out before it operated appropriately

The supplement, to accompany the original MECC manual and the talking version of Prefixes which includes talking versions of the original Prefixes print worksheets, was rewritten for the revised program. The word lists used in the Prefixes program were included in the supplement to be provided in large type and braille so that the blind students' activities would not be made more difficult by becoming a spelling problem in addition to the task presented. The supplement discussing the changes and new operational features of the program was reviewed and edited.

The final draft of Elementary Volume 5--Language Arts (Prefixes) was sent out for evaluation.

Following an in-house review of Social Studies Volume 1, it was decided that the program would not be useful to teachers unless more background information for using each program on the disk was provided. A social studies teacher who worked on the original MECC version was contacted regarding writing the necessary background information for each unit and the student worksheets necessary to the unit. Mr. Loren Dunham provided suggestions for improving the current documentation by including an enhanced "Instructional Design Model." Mr. Dunham developed the necessary background information for one of the programs, USPOP, on the Social Studies Volume 1 disk as a prototype.

MECC was contacted regarding obtaining permission to adapt three more programs, Writing A Narrative, Oregon Trail, and Word Munchers.

Work during FY 1990. Field reviews of Elementary Volume 5--Language Arts (Prefixes) were received. Numerous suggested changes were made by the consultants. Programming changes were made as recommended by both in-house and field reviewers. Some of the program's activities were reworked to simplify the language used and to reflect more modern age-appropriate questions. Instructions were altered to give precise information. The program was enhanced with a tone-playing algorithm and small musical selections were added to the tutorials associated with each of the lessons. To add appeal for the low vision users, simple pictures were created to show while making the transition from tutorials to the lesson program. An "Extensions Manual" which provides pre- and post-computer integration activities to supplement the talking version of Prefixes was written.

An in-house review of Prefixes indicated continued difficulties with the crossword puzzles and numerous small problems. The crossword puzzles were reworked for ease of use and speed in constructing the puzzles. After the next version of Prefixes is available and all the supplemental documentation is coordinated and edited, the total Prefixes program will be evaluated by in-house staff. Once the final in-house reviews of Prefixes are completed and MECC's approval of the finished product is received, the program materials will be turned over to production.

The background information on USPOP was received and reviewed by in-house staff. It was found to be quite excellent and more extensive than actually planned. Providing this same type of needed background material to accompany the ELECT series and POLICY program on the Social Studies Volume 1 disk was discussed and negotiated with Mr. Dunham. He agreed to provide the necessary materials to accompany the talking programs and original MECC manual. Because of school responsibilities and other professional activities, Mr. Dunham has been unable to work on these materials.

Work planned for FY 1991. The Seventh Microcomputer Advisory Committee recommended that APH discontinue all work on MECC programs. The committee felt that modifications of these programs do not meet relevant educational needs of blind students. Prefixes and Social Studies Volume 1 will be completed. No additional MECC programs will be modified unless specific selections are found that meet precisely defined educational needs of blind learners.



SEI Software (completed)

Purpose: To adapt educationally sound, commercially available software for use by visually handicapped persons

Project staff: Debbie Willis, Project Director  
Rob Meredith, Programmer  
Venus Elder, Project Assistant

Background. At the Second Microcomputer Advisory Committee Meeting, a modified version of Sliwa Enterprises, Inc. (SEI) educational software series was given high priority. The content of each SEI program is appropriate for high school and college students as well as adults. APH was able to make an arrangement with SEI for a customized edition of 33 of these programs. SEI, however, retained manufacturing rights to these programs. Production approval for the series was received.

Before going to production, each disk was thoroughly checked for any factual or grammatical type errors; a camera-ready introductory page, title page, and reference guides were prepared to accompany the large type manual for each program. The same materials were also prepared for braille. SEI complied with APH request that an updated version of TEXTALKER be used on its disks to make the programs compatible with the Apple IIGS. Prior to FY 1989, 20 programs were turned over to production.

During FY 1989, adaptation was completed on the remaining 13 programs and they were submitted for production. Project staff worked with production personnel as needed on manufacturing the programs. All 33 APH/SEI talking software programs became available from APH during this fiscal year. Sales of the programs were monitored.

Work during FY 1990. In order to better serve APH's customers by determining its own production schedule, APH negotiated manufacturing rights for the 33 APH/SEI talking software programs modified especially for APH. Manufacturing rights and the 33 masters were received. The masters were spot-checked; several "bugs" were found and corrected. Duplicates for the Department of Educational and Technical Research, for production, and for Steve Sliwa were made. The masters were then stored for safe keeping.

Work planned for FY 1991. No further development is planned regarding the SEI programs. Sales of the programs will continue to be monitored to determine the need for any further activity.

Ms. Emily Fitzpatrick, Teacher of the Visually Handicapped, c/o Scott County School Board Office, Gate City, Virginia

Sister M. Margaret Fleming, Teacher, St. Lucy's Day School, Philadelphia, Pennsylvania

Ms. Ann Gelles, Teacher of the Visually Handicapped, El Crystal School, Millbrae, California

Mr. Ted Lennox, Teacher of the Visually Handicapped, Carr School, Lincoln Park, Michigan

Ms. Susan Mangis, Teacher of the Visually Handicapped, Coyle Avenue School, Carmichael, California

Ms. Deborah Mason, Primary Teacher of the Visually Handicapped, Overbrook Educational Center, Philadelphia, Pennsylvania

Ms. Jill Patton, Teacher of the Visually Handicapped, Grattan Elementary School, San Francisco, California

Ms. Collett Perry, Teacher of the Visually Handicapped, Valle Verde Elementary School, Walnut Creek, California

Ms. Deanna Scoggins, Elementary Teacher, Kentucky School for the Blind, Louisville, Kentucky

Ms. Nancy E. Sewell, Second Grade Teacher, Tennessee School for the Blind, Nashville, Tennessee

Mr. Steve Sternfeld, Teacher of the Visually Handicapped, Marina Middle School, San Francisco, California

Ms. Theadosia Vine, Primary Teacher, The Governor Morehead School, Raleigh, North Carolina

Ms. Karen Wood, Functional Reading Teacher, Colorado School for the Deaf and the Blind, Colorado Springs, Colorado

#### Classroom Calendar Project

Mrs. Melinda Atkins, Teacher, Visually Impaired Preschool Services, Louisville, Kentucky

Ms. Eileen Burke, Teacher, Dallas Services for Visually Impaired Children, Dallas, Texas



### Consultants

In addition to the consultants formally acknowledged in this section, appreciation is extended to the many individuals who have willingly given of their time and expertise in cooperating with the various research and development projects underway by responding to questionnaires, by answering less formal queries for information, and by working with research staff in countless ways such as: (a) identifying particularly talented teachers and other professionals to serve on committees and/or as expert reviewers; (b) recommending programs, teachers, and students appropriate for field evaluation sites; and (c) facilitating field evaluation efforts. Only through the splendid and continuing support of professionals working in the field and the people they serve is APH able to maintain its highly effective research and development program.

### Braille Language Program

Dr. Samuel C. Ashcroft, Professor (Emeritus), Peabody College, Vanderbilt University, Nashville, Tennessee

Mr. Helen Berry, Teacher (Emeritus), Missouri School for the Blind, St. Louis, Missouri

Mrs. Debbie Mullarkey, Teacher of the Primary Visually Handicapped, Leawood School, Columbus, Ohio

Mrs. Mary Powers, Consultant for the Visually Handicapped (Emeritus), South Carolina State Department of Education, Columbia, South Carolina

Mrs. Sara Spivey, Teacher (Emeritus), Cobb County Schools, Marietta, Georgia

### Teacher Evaluators

Ms. Linda Allgeyer, Itinerant Teacher, Special Services, Lincoln Park, Michigan

Ms. Bridget Bassett, Primary Teacher of the Visually Handicapped, Overbrook Educational Center, Philadelphia, Pennsylvania

Ms. Ingrid Bettis, Third Grade Teacher, Tennessee School for the Blind, Nashville, Tennessee

Ms. Robin Boyd, Teacher of the Visually Handicapped, Meadowview Elementary School, Meadowview, Virginia

Ms. Sara Cameron, Itinerant Teacher, Macomb Intermediate School District, Warren, Michigan

International Business Machines Corporation; Louisville, Kentucky  
International Business Machines National Support Center for Persons with  
Disabilities; Atlanta, Georgia  
Kansas State School for the Visually Handicapped; Kansas City, Kansas  
Kentucky Department for the Blind; Frankfort, Kentucky  
Kentucky School for the Blind; Louisville, Kentucky  
LaGrange Elementary School; LaGrange, Kentucky  
Leawood Elementary, Columbus Public Schools; Columbus, Ohio  
Los Angeles County Office of Education; Canyon County, California  
Macomb Intermediate School District; Warren, Michigan  
Marina Middle School; San Francisco, California  
Mindplay Software; Tucson, Arizona  
Minnesota Educational Computing Corporation (MECC); St. Paul, Minnesota  
Montana School for the Blind; Great Falls, Montana  
National Federation of the Blind; Baltimore, Maryland  
National Federation of the Blind, Research and Development; Frankfort,  
Kentucky  
New Mexico School for the Visually Handicapped; Alamogordo, New Mexico  
New York Association (Lighthouse) for the Blind; New York, New York  
New York Institute for Special Education; New York, New York  
Nina Harris Exceptional Center; Pinellas Park, Florida  
North Carolina Division Services for the Blind; Raleigh, North Carolina  
Oldham County Head Start Program; Prospect, Kentucky  
Oregon School for the Blind; Salem, Oregon  
Overbrook Educational Center; Philadelphia, Pennsylvania  
Overbrook School for the Blind; Philadelphia, Pennsylvania  
Perkins School for the Blind; Watertown, Massachusetts  
Pikes Peak Board of Cooperative Services; Colorado Springs, Colorado  
Pinellas County Schools; St. Petersburg, Florida  
Price Elementary School; Louisville, Kentucky  
RC Systems; Bothell, Washington  
St. Lucy's Day School; Philadelphia, Pennsylvania  
Sensible Software; Troy, Michigan  
Sliwa Enterprises, Incorporated; Woodland, California  
South Shore Educational Collaborative; Hingham, Massachusetts  
Special Services; Lincoln Park, Michigan  
Street Electronics Corporation; Santa Barbara, California  
Tennessee School for the Blind; Nashville, Tennessee  
Texas School for the Blind; Austin, Texas  
University of Louisville, Perceptual Alternatives Lab; Louisville, Kentucky  
University of Texas at Austin; Austin, Texas  
Utah School for the Blind; Ogden, Utah  
Valle Verde Elementary School; Walnut Creek, California  
Virginia Department for the Visually Handicapped; Richmond, Virginia  
Vision Software; Lexington, Kentucky  
Visually Impaired Preschool Services; Louisville, Kentucky  
Whetstone High School; Columbus, Ohio  
Wichita Council for Preschool Blind; Wichita, Kansas  
World Book, Inc.; Chicago, Illinois

Agencies Participating in Research

In addition to the agencies named here, appreciation is also extended to the many other agencies which cooperated with APH's research efforts by permitting members of their staffs to serve as consultants or respondents to requests for information.

Alabama School for the Deaf and Blind; Talladega, Alabama  
Alliance for Technology Access; Albany, California (formerly National Special Education Alliance; Cupertino, California)  
American Foundation for the Blind National Technology Center; New York, New York  
Anchor Center for Blind Children; Denver, Colorado  
Apple Computer, Inc.; Cupertino, California  
Arizona State School for the Deaf and Blind; Scottsdale, Arizona  
Athens High School; Raleigh, North Carolina  
BEGIN (Babies Early Growth Intervention Network); Center for the Visually Impaired, Atlanta, Georgia  
Blind Babies Foundation; San Francisco, California  
Broderbund Software; San Rafael, California  
Bucks County Intermediate Unit; Doylestown, Pennsylvania  
Camden Station Elementary School; Crestwood, Kentucky  
Capitol Area Intermediate Unit; Camp Hill, Pennsylvania  
Carr School; Lincoln Park, Michigan  
Central Pennsylvania Special Education Resource Center; Harrisburg, Pennsylvania  
Children's Center for the Visually Impaired; Kansas City, Missouri  
Churchill Park School; Louisville, Kentucky  
Claris Corporation; Mountain View, California  
Colorado School for the Deaf and the Blind; Colorado Springs, Colorado  
Council for Exceptional Children Center for Special Education Technology; Reston, Virginia  
Coyle Avenue School; Carmichael, California  
Dallas Services for Visually Impaired Children; Dallas, Texas  
DeKalb County Schools; DeKalb, Georgia  
Disabled Citizens Computer Center; Louisville, Kentucky  
Division of Services for the Blind; Raleigh, North Carolina  
El Crystal School; Millbrae, California  
Eloise Japhet School; San Antonio, Texas  
Expert Systems, Software, Incorporated; Nashville, Tennessee  
Fairfax County Public Schools; Falls Church, Virginia  
Fairmont High School; Fairmont, Minnesota  
Florida School for the Deaf and the Blind; St. Augustine, Florida  
FOCUS Media Software, Inc.; Garden City, New York  
Foundation for Blind Children; Scottsdale, Arizona  
Foundation for the Junior Blind; Los Angeles, California  
The Governor Morehead Preschool Program; Greensboro, North Carolina  
The Governor Morehead School; Raleigh, North Carolina  
Grattan Elementary School; San Francisco, California  
Hampton Elementary School; Detroit, Michigan  
Hearsay, Inc.; Brooklyn, New York

New Products. Establish procedures for issuing "First Run" work orders for new products.

Repairs. Transfer repair work on Speaqualizers, APH PocketBrailles, and Echo Commanders to the Repair Department after completing needed documentation.

Shipping Cartons. Work to identify and consolidate boxes currently being used.

Speaqualizer. Complete repair manual, install new speech, and identify new keypad.

Speaqualizer MC. Continue developing, install new speech, and identify new keypad.

Swing Cell. Revise the drawing for the Swing Cell to reflect a design change.

Set up printed circuit process for prototypes.

Upgrade some of the older production manuals.



SEI and APH software programs. APH's disk duplicator and all the software programs were turned over to the Flexible Record Department in March 1990, along with the documentation manual. Assistance was given as needed to help get production runs started.

6-foot Printer Cable for APH PocketBraille. This was turned over to Purchasing in August 1989.

Speaqualizer. This was turned over to Manufacturing along with documentation to the Electronic Repair Department in January 1990. Work on the repair procedure manual was underway.

Speaqualizer Keypad Control Box--Redesign. New designs that will work with both the old and the new MC models were sought.

Speaqualizer MC. New boards were received and Larry Skutchan initiated work on the software program to use with them.

Talking Typer. The numbers were set up for these kits and entered into APH's management system in March 1990 and the bills of materials were prepared. Artwork for labels was completed and turned over to Production in May 1990.

Talking Utilities for DOS 3.3. The division put 197 units in stock in September 1989 and also entered the bill of material into APH's management system.

TEXTALKER GS The new numbers were set up for entry into APH's management system, a bill of material was entered into the system in March 1990. Artwork for all the labels was drawn, work orders were issued, and most were completed. After completing the first 250 units, the product was turned over to the Flexible Record Department for completion.

Work planned for FY 1991.

APH Portable Plus Record Player. Complete repair manuals.

Digital Audio Project. Apply research enabling archiving of National Library Service master recordings.

GE Patch Cord Kit. Plan redesign and repackaging for the patch cord kit.

Home Based Media--Sensory Pad. Work on electronics and pad.

Multiple Headset Adaptor. Redesign the headset case for the mini adapter plug.

APH Scientific Calculator: for the Apple II Computer. Work orders completed and product readied for final packaging.

Apple IIGS Owner's Guide: Disk Edition. This program was received in August 1989. The Division set up new numbers, ordered the disks, opened work orders, and drew the labels. This was completed and 100 units were placed in stock in December 1989.

Braille Keyboard Overlay for the Apple IIGS. The production manual was turned over to Manufacturing in December 1989.

Cassette Tape Interface Device. This product was turned over with documentation to Manufacturing in January 1990.

Digital Audio Project. A final report was completed in October 1989. Frank Hayden was asked to give a brief presentation of the report at the Annual Meeting in October 1989. The National Library Service has extended the project to November 1991.

Echo Commander without TEXTALKER. Three (3) units were sent to Street Electronics in February 1990 for evaluation of sound quality. Street Electronics reported that they found no problems with the unit.

External Memory Module. This was turned over to Manufacturing along with documentation in January 1990.

Home Based Media--Sensory Pad. Work on developing a mat and electronics for this resumed. Bid packages have been prepared and sent to several companies. Estimated selling price will determine the feasibility of this product.

Interpoint/Dymo Slate/Stylus U with Paper. This was a redesign combining the Slate/Stylus with its special paper in one package. Drawings were prepared on how to package this. Two bills of materials were set up, one for the current way that it is packaged, and one for the way it will be packaged when current stock on hand is depleted. The new bill of material has been entered into APH's management system. Documentation has been written and turned over for production.

Playing the Crucial Role (VHS Video Cassette Version). This version was turned over to the manufacturing division along with the documentation in September 1989.

Replacement material for items made out of black fiber. In kits having containers made out of black fiber, suitable replacements were found and approved. The bills of materials were changed accordingly.

Technical Research Division

Purpose: To develop products involving high-technology and to introduce other new products for production

Division staff: Bob Phelps, Manager  
James Robinson, Manufacturing Specialist  
Frank Hayden, Manufacturing Specialist  
Darlene Donhoff, Technical/Clerical Assistant

Background. For many years APH personnel from its research and new products departments have worked closely together in the development of electronic and other technological products and in the process of transforming experimental prototypes of new products into manufactured goods. Because of this close relationship, in January 1989 an organizational change was made in which the New Products Department became the Technical Research Division of the Department of Educational and Technical Research (previously the Department of Educational Research).

Work during FY 1990. The following briefly describes projects addressed by this division:

AC/DC Rechargeable 4-track Cassette Tape Recorder/Player. Worked in conjunction with Thompson Consumer Electronics on redesign of the Model 5194 General Electric Tape Player and to develop a handicap-lever.

APH Management System. Bob Phelps and Darlene Donhoff worked with the production coordinators in entering approximately 134 multilevel bills of materials into the Xerox system. Bob Phelps partially turned over final implementation of the APH Management System to Maureen Eddins in April 1990.

APH PocketBraille. No redesign was planned except for the software. The APH PocketBraille along with documentation was turned over to the Electronic Repair Department in January 1990. Work on the repair procedure manual was initiated. Copy for the APH PocketBraille Manual Revisions was received and a work order for its manufacture issued. It has been completed.

APH Portable Plus Record Player. Tom Poppe and James Robinson worked on case molds and ordering all the hardware materials. Circuit boards were received and tested by James Robinson and Frank Hayden. All work orders were issued for the large type, braille, and flexible record instructions. A packaging box was designed and ordered. Ten prototype units were built following production manual procedures. Production and its documentation were turned over to the Electronic Repair Department in December 1989. Work on the repair procedures manual was initiated. Revisions required for feedback problems were made. Production manual revisions were made and 30 units were sent to Shipping and became available in June 1990.





Technical Research Division

Design Improvements of Existing Products (continuing)

Purpose: To continuously examine existing products and to modify them for improved use, to utilize better materials or replace components no longer available, and to facilitate production

Project staff: Tom Poppe, Model and Pattern Maker  
Technical Research Division personnel

Background. Regular meetings are held addressing the production of new products and the improvement or redesign of existing products. Existing products that come to the attention of the group comprising these meetings are those for which APH has received complaints from customers, for which Purchasing is no longer able to obtain the raw materials/components required for their manufacture, for which new materials or manufacturing processes have been identified that would improve their quality or facilitate their manufacture, or for which less costly manufacturing processes are sought. Some changes to products are not noticeable to consumers, others are quite apparent.

Work during FY 1990. Products requiring changes during this period included:

Bright Sights: Learning to See. Initiated redesign of geometric shapes, cubes, posts, and peg board hole for injection molding.

Change Tactual Diagram Kit. Changed packaged from black fiber to corrugated cardboard.

Fine Motor Development Materials: Twist, Turn, and Learn. Redesigned plastic bearings and spindles for injection molding.

Game Kit. Changed package from black fiber to corrugated cardboard.

Sensory Stimulation Kit's Nail Dazzler. Reinforced motor section.

Wooden Constructo Set: Junior. Changed package from black fiber to corrugated cardboard.

Wooden Constructo Set: Senior. Changed package from black fiber to corrugated cardboard.

Work planned for FY 1991. Redesign will be addressed as specific products are identified for which such is needed.

Analysis of the 1990 Registration Data (new)

Purpose: To describe the legally blind population registered through APH

Project staff: Karen Poppe, Project Director

Background. Each year information concerning legally blind students in the nation is reported to the American Printing House for the Blind in order to register eligible students for federal quota funds. Periodically, these data are examined to discern trends within the population and general characteristics of students requiring materials and services. The most recent of these analyses is reported in Distribution of Quota Registrants in 1987: Grade Placement, Visual Acuity, Reading Medium, School of Agency Type, and Age that was prepared by Suzette Wright.

Work planned for FY 1991. A full analysis of the 1990 registration data will be performed. Data will be categorized and analyzed by relating information on school systems or agencies (4 categories), grade placement (20 categories) visual acuity (9 categories), and reading medium (5 categories). The average age of students will also be computed. Additional attention will be given to comparing the information examined in this study to the 1987 registration data; such an inter-study comparison was not possible in 1987 due to many irregularities found in how data were reported to APH during that year and the previous years. Categories of information requested are now more clearly defined and mutually exclusive.

A full report of this study will be composed and made available upon request.

Adult Blind Product Needs (new)

Purpose: To identify specific training and/or other materials, not available from other sources, needed by (a) the adult blind population and (b) the young adult population preparing to enter the work world

Project staff: June E. Morris, Project Coordinator

Background. APH has been aware for some time of a perceived need for materials for the adult blind population. This need has been discussed with its Educational Research and Development Committee, which has shared the concern. The concern was substantiated when 12 ex officio trustees responding to APH's Spring 1990 "Ex Officio Trustee Questionnaire" echoed it. The problem has been identification of the specific types of materials needed.

Work planned for FY 1991. A letter will be written to each of the 12 ex officio trustees noting a need for adult products asking for more specific information as to their needs and/or the kinds of products envisioned to meet their needs. With the resulting information providing a starting point, a meeting will be convened of persons working with the adult blind population to attempt to specify the kinds of products needed and to determine priorities for such materials. With this kind of information, APH will be able to articulate a plan to address the needs.



Surveys of Ex Officio Trustees (series)

Purposes: To obtain information for APH (a) regarding needs for materials and (b) for administrative purposes

Project staff: June Morris, Project Director  
Karen Poppe, Project Assistant

Background. Periodically, ex officio trustees have been queried about timely topics (e.g., specific textbook needs, specific needs for special teaching materials, preferred days for Annual Meetings, resources for purchasing educational materials, information on minimum competency testing in their states/agencies, etc.).

Work during FY 1990. Two questionnaires were sent out during the year to all ex officio trustees. The first queried interest in having a special administrators workshop addressing common concerns of administrators of rehabilitation and education programs serving legally blind persons. Results indicated there is interest and the preferred time is with APH's Annual Meeting, possibly for 1 1/2 days. Unfortunately, there was little consensus on specific topics to be addressed. The second survey queried the ex officios' perception of APH's services and products, preferred days for the Annual Meeting, need for Spanish editions of materials, and funding sources, by percentage, for educational materials for legally blind students/clients. The results will be known in June 1990.

Work planned for FY 1991. Ex officio trustees will be surveyed for input on issues and concerns as needs arise. See section on "New Educational Measures Identification."

After all aspects of the Teacher's Disk, Student's Disk, and documentation were coordinated, accurate, and working appropriately, Talking Typer was prepared for production. The program will include a Teacher's version in both 5.25" and 3.5" formats as well as supplemental Student disks also available in the same disk formats. The documentation will be provided in large type, on disk, and on cassette.

Work planned for FY 1991. Talking Typer is complete. It will be available during this fiscal year. Changes to future versions will be dictated by responses from customers.

Talking Typer (completed)

Purpose: To provide students/clients and teachers with appropriate software and documentation for use in teaching and learning typing skills with computers

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Rob Meredith, Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Committee Meeting, a typing program called Kids Can! Typer, developed by Ted Hasselbring and Carol Hamlett for sighted special education students, was demonstrated and discussed. The advisory group gave a speech-adapted version of this program a high priority. APH acquired complete marketing rights to the speech-adapted version and contracted with Carol Hamlett to make the necessary programming changes. Production approval was requested and received for this product.

An initial version of the adapted program (teacher disk, student disk, and documentation) was completed. The three components were thoroughly reviewed by in-house staff and several major "bugs" were found. A review of the entire program with suggestions for changes was sent to Carol Hamlett. While initial plans had not included adding speech to the teacher disk, Miss Hamlett reprogrammed that disk to make all the essential information being presented to the screen talk. A revised version was sent to APH. A preliminary review indicated there were still too many problems in the program's operation to send it out for formal evaluation and the manual was difficult to follow. Therefore, more revisions were required.

During FY 1989, all known bugs were eliminated, several speech oriented enhancements (including complete speech support for the editor) were installed, and the documentation was revised. After numerous in-house reviews and changes, a final draft of the entire Talking Typer program was sent out for evaluation by consultants.

Work during FY 1990. After being reviewed by outside consultants and undergoing repeated in-house examinations, the Talking Typer underwent numerous small changes. Some of these were in the nature of bug fixes, but most were aesthetic changes to enhance the usefulness and logic of the program. The manual was edited, revised for accuracy and thoroughness, and reorganized for understanding and ease of use. Camera-ready copy of the manual was prepared for production.

Informal meetings were held to discuss final packaging of the disks, the number of disks to include in 5.25" and 3.5" formats, and instructions for use and rights regarding copying of the disks. There was also discussion of the best features and settings to include as defaults with the program as shipped. Because of the complexity of placing innumerable options under control of the instructor via the Teacher's Disk, the total program was given repeated serious in-house reviews.

The software disk entitled APH Presents the Talking Apple was reprogrammed to convert the modules over to ProDOS, to reorganize the source code for current editors in use, and to make the program recognize the wider variety of Apple II computers currently available. This program was updated to include features of the Apple II GS, new features of TEXTALKER, and suggestions from the field.

Sections of the teacher's manual were updated and rewritten to include current information.

Work planned for FY 1991. After the problems with LetterTALK+ are corrected by the programmer, it will again be reviewed by in-house staff. Final necessary changes will be made to the program disk. The documentation accompanying LetterTALK+ will be revised, edited, and a final draft prepared. Reference sheets to accompany the disk will be prepared. The final draft of the LetterTALK+ software program with accompanying documentation and reference sheets will be evaluated by outside consultants. After suggested modifications have been made, LetterTALK+ will have a final in-house review and then be prepared for production.

APH Presents the Talking Apple will be evaluated by in-house staff. Final changes will be made and a final review will be given before including this disk in the Talking Literacy Kit for Apple II computers.

The remaining sections of the teacher's manual will be updated. The revised manual will then be recorded. The computer parts collection in the kit will also be reviewed and updated.

The entire revised kit will be evaluated by two consultants. After final revisions and a final in-house review, the Talking Literacy Kit for Apple II Computers will be turned over to production.



Talking Literacy Kit (TALK): Apple II Computers (continuing)

Purpose: To provide an introductory set of speech-accessible computer software and related materials for any of the current Apple II family of computers which could be easily integrated into existing programs of computer literacy or introduction to computers for legally blind youth through adult beginners

Project staff: Debbie Willis, Project Director  
Jeff Wheatley, Programmer  
Rob Meredith, Programmer  
Fred Otto, Project Assistant  
Venus Elder, Project Assistant

Background. During the fall and winter of 1985, the Talking Apple Literacy Kit (TALK): //e Edition was in the production pipeline of APH. The product became available in September 1986. First run sales were most encouraging. Subsequent runs of the kit were initiated and sales remained brisk. In response to requests from the field, APH offered sets of the Brailled Keyboard model for the Apple //e, a component of the TALK, as a separate item. The name of the kit and other components were changed in 1987 in order to be in compliance with the legal guidelines of Apple Computer, Inc.

At the Fifth Microcomputer Advisory Committee Meeting, a revision of the kit to include all current Apple II computers received high priority. Work on two components of the revised kit, the Brailled Keyboard Overlay for the Apple IIGS(R), and the disk introducing the keyboard, word processing, and games was started.

Work on the disk was continued during FY 1989. The introductory word processing program, introductory games, and keyboard practice were programmed for speech and large print output to the screen. The program was named LetterTALK+. Documentation to accompany the disk was drafted. The program was reviewed in-house several times and underwent many changes.

Work on the Brailled Keyboard Overlay for the Apple IIGS also continued. Prototypes of the overlay were developed, checked for accuracy, tested for legibility, and a brief supplement to accompany the product was written. After some revisions, the materials were completed and turned over to production. It was decided to offer LetterTALK+ and the Braille Keyboard Overlay for the Apple IIGS as separate products from the kit. The overlays were produced and are being sold separately from the kit in packages of five.

Work during FY 1990. The draft of the documentation for LetterTALK+ was expanded to include "Extension Activities." Review of LetterTALK+ by in-house staff indicated problems related to the speed settings for the operation of the programs on the disk and several other major operational changes were needed. LetterTALK+ was used at the Kentucky School for the Blind during its summer enrichment program. Several problems were discovered as a result of the students' use of the program. An extensive list of changes was sent to the programmer.

Along with the work already mentioned, the Microcomputer Group worked on some fundamental design changes to the Speaqualizer. These included the ability to work with screens up to 50 lines long, the addition of nonvolatile RAM to hold user settings and preferences, new connectors for a new keypad (the company manufacturing the old keypad is discontinuing the product), the inclusion of a 1/8-inch phono jack on the card's rear panel, and the addition of a 9-pin serial port on the card's rear panel.

Work planned for FY 1991. The version of Speaqualizer for computers using the micro channel bus will be completed. The redesign of the original Speaqualizer will be completed. Software enhancements will continue to improve Speaqualizer's usefulness. A Spanish version of this system also may be developed.

Speaqualizer (continuing)

Purpose: To produce a speech synthesis system for IBMs

Project staff: Larry Skutchan, Systems Programmer  
Jeff Wheatley, Programmer  
Jim Robinson, Manufacturing Specialist

Background. The Speaqualizer is a hardware based access package for the IBM computer. It permits the blind user to use speech to examine text displayed on the screen.

Speaqualizer was developed by the Research Committee of the National Federation of the Blind. After obtaining production approval from the Educational Research and Development Committee, APH research staff members began working with the National Federation of the Blind to continue development of the device's firmware. It became available from APH in July 1987. Since then, several enhancements have been introduced and offered to existing users as upgrade packages that provide the new features to existing Speaqualizers. These include features like the ability to completely silence the speech for use by sighted coworkers, improved cursor handling performance, and improvements with respect to use in word processing applications. In addition, the DIP switches on the board were used to provide configuration information and preferred startup parameters. The boards were also modified to work on the new, faster machines becoming available.

Work during FY 1990. The version of Speaqualizer for computers using the micro channel architecture (called Speaqualizer MC) continued during the year and the Microcomputer Group acquired a working prototype of the board.

In addition to the work on Speaqualizer MC, APH has identified and made preliminary steps to the incorporation of a highly intelligible speech system into both versions of Speaqualizer (original and MC). New speech interface software was written to support the new speech system and hardware modifications were made to an existing board to allow the Microcomputer Group to fine tune the system. The new speech will be used for both versions of Speaqualizer. Unfortunately, it does not appear that existing Speaqualizers can be upgraded to take advantage of the new speech system. Software support for both speech systems will continue, though, into the foreseeable future.

Along with the new Speaqualizer MC and the new speech system for both Speaqualizers, the Microcomputer Group continued to work on firmware enhancements. Those incorporated but not released included the ability to use Speaqualizer's serial port to take information from redirected output in the DOS environment and the ability to use the shift key on the IBM keyboard to silence the current line of speech and continue speech with the next line of text. The Microcomputer Group also worked on enhancements to better interact with the newer styles of programs appearing on MS DOS machines. Such improvements should work with programs that use pop-up windows and varying methods of highlighting menu bars.

Ms. Carol Danielson, Teacher, Dallas Services for Visually Impaired Children,  
Dallas, Texas

Ms. Patty Dilg, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Ms. Hedy Jacobson, Teacher of the Visually Handicapped, Hampton Elementary  
School, Detroit, Michigan

Ms. Suzi McDonald, Preschool Teacher for the Visually Impaired, Arizona State  
School for the Deaf and Blind, c/o Foundation for Blind Children,  
Scottsdale, Arizona

Ms. Marianne T. O'Connor, Preschool Teacher, St. Lucy's Day School,  
Philadelphia, Pennsylvania

Ms. Jill Patton, Teacher of the Visually Handicapped, Grattan School, San  
Francisco, California

Mrs. Deanna Scoggins, Elementary Teacher, Kentucky School for the Blind,  
Louisville, Kentucky

Ms. Ela Schacklett, Preschool Teacher, Children's Center for the Visually  
Impaired, Kansas City, Missouri

Ms. Anna Swenson, Teacher of the Visually Handicapped, Pine Spring Elementary  
School, Fairfax County Schools, Falls Church, Virginia

Development of Guidelines for Literacy: Selecting Appropriate Media for  
Visually Handicapped Students

Mr. Norman Anderson, Teacher, Maryland School for the Blind, Baltimore,  
Maryland

Dr. Natalie Barraga, Professor Emeritus, University of Texas, Austin, Texas

Mr. Charles B. Boyer, Superintendent, California School for the Blind,  
Fremont, California

Mr. John di Francesco, President, Braille Revival League, American Council of  
the Blind, Oakland, California

Sr. M. Margaret Fleming, Teacher, St. Lucy's Day School, Philadelphia,  
Pennsylvania

Dr. Randall Jose, Optometrist, Tulsa, Oklahoma

Dr. Sally S. Mangold, Professor, San Francisco State University, San  
Francisco, California



Mrs. Suzi McDonald, Preschool Teacher, Arizona School for the Deaf and Blind and the Foundation for Blind Children, Scottsdale, Arizona

Dr. Evelyn Rex, Professor, Illinois State University, Normal, Illinois

Mr. Fred Schroeder, Director, New Mexico Commission for the Blind, Santa Fe, New Mexico (Also a member of the Board of Directors, National Federation of the Blind)

Dr. Susan Spungin, Associate Executive Director, American Foundation for the Blind, New York, New York

#### Early Childhood Microcomputer Applications

Mr. Jim Allen, Computer Specialist, Texas School for the Blind, Austin, Texas

Mrs. Linda Clarke, Mentor Teacher, Los Angeles Unified Schools, Los Angeles, California

Sister M. Margaret Fleming, Teacher, St. Lucy's Day School, Philadelphia, Pennsylvania

#### Educational Research and Development Committee

Dr. Michael J. Bina, Superintendent, Indiana School for the Blind, Indianapolis, Indiana

Mrs. Barbara N. Bowman, Director, Instructional Materials Resource Center, Richmond, Virginia

Mr. Charles B. Boyer, Superintendent, California School for the Blind, Fremont, California

Mr. Jerry Watkins, Superintendent, New Mexico State Department of Education and New Mexico School for the Visually Handicapped, Alamogordo, New Mexico

Mr. John D. Watson, Director, Special Education Materials Clearinghouse and Depository, Tacoma, Washington

Dr. Robert J. Winn, President, The Hadley School for the Blind, Winnetka, Illinois

Infant Skills Project

Teacher Evaluators

- Mrs. Melinda Adkins, Teacher, Visually Impaired Preschool Services,  
Louisville, Kentucky
- Ms. Debbie Alvarado, Teacher, Dallas Services for Visually Impaired Children,  
Dallas, Texas
- Mrs. Sharon Bensinger, Director, Visually Impaired Preschool Services,  
Louisville, Kentucky
- Mrs. Phyllis Cole, Supervisor, DeKalb County Schools, DeKalb, Georgia
- Ms. Carol Danielson, Supervisor, Dallas Services for Visually Impaired  
Children, Dallas, Texas
- Ms. Anne McComiskey, Director, BEGIN Program Center for the Visually Impaired,  
Atlanta, Georgia
- Ms. Tammy Shirley, Occupational Therapist, Dallas Services for Visually  
Impaired Children, Dallas, Texas
- Mrs. Charlie Sirman, Teacher, Visually Impaired Orthopedically Handicapped  
Classes, DeKalb County Schools, DeKalb, Georgia

Literacy Project

- Ms. Jeri Adrian, Teacher, Dallas Services for Visually Impaired Children,  
Dallas, Texas
- Ms. Melinda Atkins, Teacher, Visually Impaired Preschool Services, Louisville,  
Kentucky
- Ms. Mary Blansett, Teacher, Wichita Council for Preschool Blind, Wichita,  
Kansas
- Ms. Pauletta Feldman, Parent, Louisville, Kentucky
- Ms. Ruth Parker, Teacher, Dallas Services for Visually Impaired Children,  
Dallas, Texas
- Ms. Ellen Perry, Teacher, Leawood Elementary, Columbus Public Schools,  
Columbus, Ohio
- Ms. Angela Pratt, Director and Teacher, Wichita Council for Preschool Blind,  
Wichita, Kansas
- Mrs. Mary Ann Reynolds, Teacher, Visually Impaired Preschool Services,  
Louisville, Kentucky

Microcomputer Applications

Mr. M. R. Anderson, Consumer, Tampa, Florida

Ms. Patty Barker, Technology Interface Specialist, Division of Services for the Blind, Raleigh, North Carolina

Mr. Steve Belpri, Engineer, Hearsay, Inc., Brooklyn, New York

Ms. Bernice Bird, Student, Rochester, New York

Ms. Eileen Blair, Software Licensing Representative, Apple Computer, Inc., Cupertino, California

Ms. Judy Bliss, President, Mindplay Software, Tucson, Arizona

Mr. Jim Breene, Representative, IBM National Support Center for Persons with Disabilities, Atlanta, Georgia

Mr. Dennis Brown, Consumer, Stone Mountain, Georgia

Mr. Randy Carlstrom, President, RC Systems, Inc., Bothell, Washington

Mr. Steve Carlton, Product Manager, Claris Corporation, Mountain View, California

Mrs. Linda Clarke, Vision Teacher, Los Angeles County Office of Education, Canyon County, California

Dr. Tim Cranmer, Director, Research and Development, National Federation of the Blind, Frankfort, Kentucky

Mr. John DeRing, Resource Room Teacher, Whetstone High School, Columbus, Ohio

Mr. Loren Dunham, Teacher, Fairmont High School, Fairmont, Minnesota

Mr. Garret Ellison, Engineer, World Book, Inc., Chicago, Illinois

Dr. Susan Elting, Project Director, CEC Center for Special Education Technology, Reston, Virginia

Mr. Neal Ewers, Consumer, St. Paul, Minnesota

Sister M. Margaret Fleming, Teacher, St. Lucy's Day School, Philadelphia, Pennsylvania

Dr. Emerson Foulke, Director, Perceptual Alternatives Lab, University of Louisville, Louisville, Kentucky

Mr. Bob Glass, Apple Planning Team Member, Apple Computer, Inc., Louisville, Kentucky

- Mr. Ralph Gore, Consumer, Ft. Myers, Florida
- Mr. Steve Hahn, Teacher, Kansas State School for the Visually Handicapped,  
Kansas City, Kansas
- Ms. Carol Hamlett, Systems Programmer, Expert Systems Software, Inc.,  
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- Mr. William Hammond, Vice-President of Product Development, World Book, Inc.,  
Chicago, Illinois
- Mr. Chuck Hartley, President, Sensible Software, Troy, Michigan
- Ms. Joellen Hoogerwerf, Instructor, Athens High School, Raleigh, North  
Carolina
- Mr. Frank Irzyk, Resource/Media Specialist, Central Pennsylvania Special  
Education Resource Center, Harrisburg, Pennsylvania
- Ms. Kate Jacob, Instructor, Virginia Department for the Visually Handicapped,  
Richmond, Virginia
- Ms. Eileen Kuhre, Instructor, New Mexico School for the Visually Handicapped,  
Alamogordo, New Mexico
- Mr. Dave Lyons, Programmer, Apple Computer, Inc. and DAL Systems, Cupertino,  
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- Mr. Bill Miller, Superintendent, Texas School for the Blind, Austin, Texas
- Mr. Richard Mirisola, Chief Engineer, AFB National Technology Center, New  
York, New York
- Ms. Elisa Nakata, AppleWorks Product Manager, Claris Corporation, Mountain  
View, California
- Dr. Abraham Nemeth, Mathematics Professor (Emeritus), Southfield, Michigan
- Ms. Gail Polzer, Teacher, Bucks County Intermediate Unit, Doylestown,  
Pennsylvania
- Ms. Harleen Powers, Computer Teacher, Florida School for the Deaf and the  
Blind, St. Augustine, Florida
- Dr. Sandy Ruconich, Computer Specialist, Kentucky School for the Blind,  
Louisville, Kentucky
- Mr. Adam Ruschival, Manager, Kentucky Intermediate Materials Resource Center,  
Kentucky School for the Blind, Louisville
- Dr. Peter Scialli, Psychologist, Washington, DC



Mr. Fred Sinclair, Director (Emeritus), Clearinghouse Depository for Handicapped Students, Sacramento, California

Dr. Steve Sliwa, President, Sliwa Enterprises, Inc., Woodland, California

Dr. Milo Street, President, Street Electronics Corporation, Carpinteria, California

Mr. Ron Swenson, Programmer, North East Kansas Service Corporation--Technical Resource Center, Lawrence, Kansas

Mr. Wayne Thompson, Engineer, Kentucky Department for the Blind, Frankfort, Kentucky

Ms. Linda Unger, Vice-President of Product Development, FOCUS Media Software, Inc., Garden City, New York

Ms. Debra Vonk, Research Analyst, Minnesota Educational Computing Corporation, St. Paul, Minnesota

Mr. Joe Williams, Senior Staff Writer, Apple Computer, Inc., Cupertino, California

Ms. Cindy Young, Systems Engineer, International Business Machines Corporation, Louisville, Kentucky

Mr. Pedro Zurita, Honorable Secretary General O.N.C.E., Madrid, Spain

#### Multihandicapped Adolescent Project

Mrs. Jackie Brennen, Supervisor of Life Skills Program, Overbrook School for the Blind, Philadelphia, Pennsylvania

Ms. Mary Jane Brown, Program Administrator, Multihandicapped Program, New York Institute for Special Education, New York, New York

Mrs. Diane Haynes, Early Childhood Teacher, Deaf-Blind Intervention Project, Lexington, Kentucky

Dr. Bernadette Kappen, Associate Director, Overbrook School for the Blind, Philadelphia, Pennsylvania

Ms. Donna Karlson, Vocational Teacher, New York Institute for Special Education, New York, New York

Ms. Martha Majors, Assistant Supervisor, Deaf-Blind Program, Perkins School for the Blind, Watertown, Massachusetts

Ms. Betsy McGinnity, Coordinator of Vocational and Transitional Services, Perkins School for the Blind, Watertown, Massachusetts

Mrs. Marie Ruf, Transition Teacher, Deaf-Blind Intervention Project,  
Lexington, Kentucky

Mrs. Mary Zatta, Teacher, Deaf-Blind Program, Perkins School for the Blind,  
Watertown, Massachusetts

#### New Programmed Instruction in Braille

Dr. Evelyn Rex, Professor, Department of Special Education, Illinois State  
University, Normal, Illinois

Ms. Norma Schechter, Braille Transcriber, Huntington Beach, California

Dr. Marjorie Ward, Associate Professor, Department of Educational Services and  
Research, Ohio State University, Columbus, Ohio

#### Parent Early Childhood Education Series

Dr. Natalie Barraga, Professor (Emeritus), University of Texas, Austin, Texas

Dr. Vivian Correa, Professor, University of Florida, Gainesville, Florida

Dr. Verna Hart, Professor, University of Pittsburgh, Pittsburgh, Pennsylvania

Dr. Bernadette Kappen, Associate Director, Overbrook School for the Blind,  
Philadelphia, Pennsylvania

#### Parents and Visually Impaired Infants (PAVII)

Ms. Gail Cavello, Home Counselor, Blind Babies Foundation, San Francisco,  
California

Dr. Deborah Chen, Director of Special Education, Foundation for the Junior  
Blind, Los Angeles, California

Mrs. Amy Hosa, Parent, San Francisco, California

Dr. Claire Taylor Friedman, Infant Specialist, Contra Costa County, San  
Francisco, California

#### Preschool Learning Activities

Mrs. Jenny Guilda, Director, Kenwood Montessori School, Louisville, Kentucky

Mrs. Katherine Robinson, Teacher, Urban Montessori School, Louisville,  
Kentucky

Teacher Evaluators

- Ms. Melinda Atkins, Teacher, Visually Impaired Preschool Services, Louisville, Kentucky
- Ms. Debbie Alvarado, Teacher, Dallas Service for Visually Impaired Children, Dallas, Texas
- Ms. Sandy Bryant, Teacher, Preschool Service for the Visually Impaired, North Carolina Division Services for the Blind, Raleigh, North Carolina
- Ms. Martha Chambers, Teacher, New Mexico School fir the Visually Handicapped Preschool, Albuquerque, New Mexico
- Ms. Patti Dilg, Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Mrs. Pauletta Feldman, Parent, Louisville, Kentucky
- Ms. Julie Founder, Teacher, Alabama School for the Blind, Talladega, Alabama
- Ms. J. Greeley, Teacher, Anchor Center for Blind Children, Denver, Colorado
- Ms. Barbara Hatfield, Teacher, Utah School for the Blind, Ogden, Utah
- Ms. Judy Hayes, Teacher, Alabama School for the Blind, Talladega, Alabama
- Mrs. Diane Haynes, Teacher, Deaf Blind Intervention Program, Lexington, Kentucky
- Ms. Jeanette Jacobs, Teacher, Jefferson County Public Schools, Louisville, Kentucky
- Ms. Betty Knight, Teacher, Alabama School for the Blind, Talladega, Alabama
- Mrs. Camille Lancaster, Teacher, Preschool Service for the Visually Impaired, North Carolina Division Services for the Blind, Raleigh, North Carolina
- Ms. Eileen Mauerman, Teacher, Utah School for the Blind, Ogden, Utah
- Ms. Susie Moushegian, Teacher, Teacher, Dallas Service for Visually Impaired Children, Dallas, Texas
- Ms. Mary Ann O'Connor, Teacher, St. Lucy's School, Philadelphia, Pennsylvania
- Ms. Kathy Peterson, Teacher, New Mexico School for the Visually Handicapped Preschool, Albuquerque, New Mexico
- Mrs. Debbie Ramsey, Teacher, Jefferson County Public Schools, Louisville, Kentucky
- Ms. Maureen Ryder, Teacher, New York Association Lighthouse for the Blind, New York, New York

Mrs. Charlie Sirman, Teacher, Visually Impaired Orthopedically Handicapped Classes, DeKalb County School System, Atlanta, Georgia

Ms. Rose Anna Stillwagon, Evaluator, Capital Area Intermediate Unit, Camp Hill, Pennsylvania

Ms. Ann Timfhenka, Teacher, Capital Area Intermediate Unit, Camp Hill, Pennsylvania

#### Summer Seminars

##### Psychoeducational Assessment of Visually Impaired and Blind Children

Dr. Sharon Bradley-Johnson, Professor of School Psychology, Central Michigan University, Mount Pleasant, Michigan

##### Meeting the Psychosocial Needs of the Visually Impaired

Dr. Dean W. Tuttle, Professor of Special Education, University of Northern Colorado, Greeley, Colorado

#### Task Oriented Inventory and Work Skills Program

Ms. Pam Boespflug, Teacher, Montana School for the Blind, Great Falls, Montana

Dr. Sharon Bradley-Johnson, Professor of School Psychology, Central Michigan University, Mount Pleasant, Michigan

Ms. Roseann Brown, Registered Occupational Therapist, Eloise Japhet School, San Antonio, Texas

Mr. Mike Burroughs, Teacher, Pikes Peak Board of Cooperative Services, Colorado Springs, Colorado

Ms. Elly Driggers, Teacher, Montana School for the Blind, Great Falls, Montana

Ms. Andrea Evans, Teacher, Nina Harris Exceptional Center, Pinellas Park, Florida

Mr. Joe Fitzgerald, Teacher, South Shore Educational Collaborative, Hingham, Massachusetts

Ms. Marilyn Gense, Teacher, Oregon School for the Blind, Salem, Oregon

Mr. Joel Hoff, Teacher, Florida School for the Blind, St. Augustine, Florida

Ms. Beth Langley, Educational Diagnostician, Pre K Assessment Team, Pinellas County Schools, St. Petersburg, Florida

Ms. Martha Majors, Supervisor, Perkins School for the Blind, Watertown, Massachusetts



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Ms. Bobbie Vaughn, Diagnostician, Texas School for the Blind, Austin, Texas

Ms. Kim Zimmerman, Teacher, Nina Harris Exceptional Center, Pinellas Park,  
Florida

Mr. Lyman Zoebil, Teacher, Nina Harris Exceptional Center, Pinellas Park,  
Florida

Department of Educational and Technical Research Personnel

June Morris, MA, Executive Vice-President

Educational Research

|                         |                                |
|-------------------------|--------------------------------|
| Bolin, Gene             | Administrative Assistant       |
| Burton, Tobey, BA, OTR  | Research Assistant             |
| Caton, Hilda, EdD       | Research Scientist (part time) |
| Duckworth, Bill, MS     | Librarian/Research Scientist   |
| Elder, Venus, MA        | Research Assistant             |
| Meredith, Rob           | Programmer                     |
| Moore, Sheri, EdD       | Research Scientist             |
| Otto, Fred, BA          | Research Assistant             |
| Pester, Eleanor, MS     | Research Associate             |
| Poppe, Karen Peters, BA | Research Assistant             |
| Poppe, Tom              | Model and Pattern Maker        |
| Skutchan, Larry, BA     | Systems Programmer             |
| Willis, Deborah, MA     | Research Scientist             |
| Wright, Suzette, BA     | Research Associate             |

Technical Research Division

|                  |                              |
|------------------|------------------------------|
| Donhoff, Darlene | Technical/Clerical Assistant |
| Hayden, Frank    | Manufacturing Specialist     |
| Phelps, Bob      | Manager                      |
| Robinson, Jim    | Manufacturing Specialist     |

Contracted Personnel

Bradley, Eddy Jo, MA  
Carlstrom, Randy  
Dunham, Loren, MA  
Hamp, Eric, PhD  
Langley, M. Beth, MS  
Petrosko, Joseph M., PhD  
Stone, Gretchen, MEd  
Stratton, Josephine, MS  
Thompson, Wayne, RPE  
Wheatley, Jeff

Publications

- Duckworth, B. , & Garrett, D. (1989). Stanford Achievement Test, Form J: Directions for administering braille edition, primary 2. Louisville, KY: American Printing House for the Blind.
- Duckworth, B., & Garrett, D. (1989). Stanford Achievement Test, Form J: Directions for administering braille edition, primary 3. Louisville, KY: American Printing House for the Blind.
- Duckworth, B., & Garrett, D. (1989). Stanford Achievement Test, Form J: Directions for administering braille edition, intermediate 1. Louisville, KY: American Printing House for the Blind.
- Duckworth, B., & Garrett, D. (1989). Stanford Achievement Test, Form J: Directions for administering braille edition, intermediate 2. Louisville, KY: American Printing House for the Blind.
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New Products

APH Portable Plus Record Player

Apple II<sub>GS</sub> Owner's Guide: Disk Edition

Stanford Achievement Test, Form J

large type editions of 10 levels  
with print directions for administering

braille editions of 10 levels  
with print directions for administering

Parents and Visually Impaired Infants (PAVII)

Talking Utilities for DOS 3.3

TEXTALKER<sub>GS</sub>

A User's Guide to the PocketBraille. Revised Edition  
large type and braille editions available











American  
Printing House  
for The Blind  
Incorporated

Department of Educational and Technical Research  
Report of Research and Development Activities  
Fiscal 1991

*American Printing House for the Blind  
1839 Frankfort Avenue  
Louisville, KY 40206*

### Mission

The American Printing House for the Blind promotes independence of blind persons by providing special media, tools, and materials needed for education and life.

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The American Printing House for the Blind (APH) has had an ongoing research program for 40 years. Initial impetus for APH to establish a research program was from the Committee on Research of the American Association of Instructors of the Blind in recognition of the need for an effective and stabilized attack on the research problems of the field. APH's Board of Trustees approved such a program at APH's Annual Meeting held in the fall of 1951. The following spring a Research Committee was convened. The purpose of the Committee was to investigate and recommend projects in the field of educational research to be undertaken by the staff. Marjorie Hooper was appointed to direct the initial work. Her first assignment was to attend regional conferences and visit schools for the blind to meet informally with classroom teachers to learn from them the problems which seemed most pressing and which appeared to require outside help for solution.

The resulting research program carried on at APH is unique in the field of education. Although the types of research activities undertaken are similar to some of those conducted at colleges and universities, there are a number of decided advantages in having the work done through the Printing House. For example, APH serves the nation as a primary source of educational materials for legally blind students. This means that communication channels are always open between APH's staff and the ultimate consumers of its products and services. Because of this, it is possible to identify specific areas of need. And, because of this, it is possible to use the ultimate consumers, both teachers and the students themselves, in the development and evaluation of needed tools and materials.

Other direct advantages in having a research program based at APH are (a) there is a tremendous amount of expertise both under the same roof and in the community which is always available for consultation, (b) because of APH's many faceted manufacturing capabilities, it is possible to produce and use a wide array of experimental materials, (c) in preparing materials for developmental projects, experimental materials can be developed in close collaboration with production personnel, thus assuring the models will be things that can be translated into products, and (d) successful results of research efforts are reflected in production. Thus, needed materials can be identified, developed, produced, distributed, and used by those students who need them.

Currently, overall priorities for APH's research program are influenced by the priorities set by the U.S. Department of Education's Office of Special Education and Rehabilitative Services, by Congressional Appropriations Committees, by sales of existing product lines, and by both APH's staff and its Educational Research and Development Committee in response to observed, general needs of the field. Primary areas currently being addressed include early childhood, multihandicapped, low vision, braille, educational measures,

and microcomputer applications. Work being done in these areas, as well as some other activities, is briefly described in this report. In order that the reader have a general frame of reference for the work described, information is given for each project indicating its purpose, the project staff, its background, work done during APH's 1991 fiscal year, and work planned for the next year.

The spirit of APH's original research committee lives on in APH's research program. Its strength is in its interaction with the field. Many persons give of their time and expertise to cooperate with APH's research projects. Groups with particular expertise are convened to help identify specific needs in a given area and to work with research staff in developing specifications for needed new materials. Others tryout and evaluate experimental materials with the population for whom the material is intended. The sections of this report listing agencies that have participated in APH's research program and individuals who have served as consultants on the various projects give indication of the ongoing and invaluable input received from the field. Only through the outstanding cooperation of persons working in the field has APH's research program been able to thrive and to help teachers solve some of their most pressing problems by providing needed information and developing special materials designed to meet the unique needs of the students they serve.

Early Childhood





On the Way to Literacy: Early Experiences for Young Visually Impaired Children (formerly entitled Developing Literacy: Basic Skills, Concepts, and Early Experience (continuing)

Purpose: To provide a program and materials for teachers and parents of young visually impaired children to assist them in providing, from birth, the experiences and interaction necessary to develop and interrelate skills for literacy

Project staff: Suzette Wright, Project Director and Coauthor  
Josephine Stratton, Project Coauthor  
Tom Poppe, Model and Pattern Maker

Background. Literacy is often narrowly defined as the ability to read and write. In a broader sense, however, literacy refers to a person's ability to speak, listen, read, and write--to get meaning from and bring meaning to written and spoken words (Stratton & Wright, 1991). Defined in this way, the development of literacy can be seen as the interaction of many skills which begin to develop from birth. According to the literature, the components of literacy include:

1. the development of motor skills which enable the young child to explore and accumulate the experiences necessary for building concepts (Cratty, 1967; Lockman, 1986);
2. the formation of concepts concerning the world and the child's experience of it (Flavell, 1985; Ginsberg & Oppen, 1979);
3. the growth of language skills which make communication of concepts and ideas possible (International Reading Association, 1986; Wishon, Brazee, & Eller, 1986);
4. listening to stories from an early age (Granucci, 1986; Morrow, 1983; Teale, 1984; Trelease, 1982)--thus establishing a desire to read (Kontos, 1986; Trelease, 1982) and an awareness of the use of symbols (Beardsley & Marecek-Zeman, 1987; Dyson, 1984; Granucci, 1986; Kontos, 1986).

Literacy is a process much like learning to walk or talk--involving the development and interaction of skills over a long period of time which result in the ability to read, write, listen, and speak with understanding.

For the blind or visually impaired child, literacy is the same gradual process, and emerges from experiences that are meaningful to him. He needs the same opportunities for experiences as all children do. For some visually impaired children, however, the emphasis or the way of learning may be somewhat different.

The product resulting from this project will provide, in a print document, the framework for the development of literacy from birth and will suggest activities which may assist a visually impaired infant or child.

Also included will be storybooks, containing tactile and visual graphics appropriate for a young blind or low vision child along with braille and print text. Suitable commercially available products will be recommended.

Work during FY 1991. Data returned from four evaluation sites were posted and analyzed. Eight teachers and 14 parents evaluated the handbook and regularly read-aloud the tactile/visual storybooks with 27 visually impaired preschoolers over an 8- to 10-week period. Evaluators were almost unanimously pleased with the organization, overall tone, and reading level of the handbook. Their evaluation of the handbook indicated several areas where additional information was desired--extension of language and dressing skills as they relate to hand skills. No major changes were suggested and all expressed overall satisfaction with the handbook. Many positive comments were made by the teachers:

"Being a speech therapist, I was very pleased with the first section and I couldn't wait for my parents in our infant stimulation class to read it." (Infant-Communication)

"I think this is excellent due to the inclusion of many specific examples of finger and hand activities . . . should be especially helpful to parents . . . " (Toddler-Tactual Exploration)

Parents comments about the handbook included the following: "easy to understand," "reassuring," "interesting new information," "very positive--goes a long way for a scared parent."

The tactile/visual storybooks received the approval of evaluating teachers. The level of interest and progression of tactile graphics from real objects and thermoformed objects to raised line drawings was approved. Teachers liked this "progression, overall variety . . . and the decreasing prominence from 3-dimensional to 2-dimensional." This seemed a "natural sequence, increasing the challenge to the child, and making the story/text more and more the focus." Changes to the raised line drawings in one book were suggested by an evaluator to more clearly show spatial relationships and the orientation of objects. No other major changes were recommended. Asked to assess students' interest in the storybooks, information returned by teachers indicated highest interest in thermoformed and real object storybooks--particularly for younger students and potential braille readers. In answering why a particular storybook would appeal to a preschooler, comments included

"It's about things the child can understand."

"The rhythm, fun words, and repetition made the story enjoyable."

"Concepts introduced are very appropriate for this age group."

Teachers agreed there was a need for additional storybooks like the tactile/visual storybooks they had evaluated.

Following analysis of the evaluation data, revisions to the parent/teacher handbook were completed. The handbook, renamed On the Way to Literacy: Early Experiences for Visually Impaired Children, was edited by research staff. Layout and design were planned by project staff. Text was formatted accordingly and prepared as camera-ready copy. Approximately 50 line drawings were finished by project staff for inclusion in the document. Final revisions were made to each of the 10 Tactile/Visual Storybooks which are a part of the On the Way to Literacy materials. A more durable plastic was located to replace the brailon plastic used in two storybooks. Samples of several types of clear plastic were tested as a possible replacement for the PETG plastic used in the thermoformed storybooks in order to reduce cost. Final thermoform molds, braille plates, camera-ready art, and camera-ready printed text for all 10 storybooks were completed.

A production document detailing specifications for the handbook and storybooks was completed on January 9th. A final report of all project activities has been completed. Also during this fiscal year, the project's basis in theory and resulting materials were presented at the International Conference of the Association for Education and Rehabilitation of the Blind and Visually Impaired held in Washington, D.C. The presentation was well-attended and practitioners expressed much interest in the Tactile/Visual Storybooks. An article concerning the project was submitted to RE:view and was published in the summer 1991 issue.

Work planned for FY 1992. Project staff will assist production staff in producing the first run of the handbook and tactile/visual storybooks.



Supplement to On the Way to Literacy: Early Experiences for Young Visually Impaired Children (new)

Purpose: To provide additional tactile/visual storybooks for young visually impaired preschoolers using formats developed in the previous project, On the Way to Literacy

Project staff: Suzette Wright, Project Director  
Tom Poppe, Model and Pattern Maker

Background. During the evaluation of the On the Way to Literacy materials, evaluators requested that additional tactile/visual storybooks be developed, particularly storybooks featuring real objects and thermoformed replicas of real objects. Students were assessed as being most interested in the real object and thermoformed storybooks, although each book was mentioned by one or more students as his/her favorite. The range of types of tactile graphics used in the storybooks was approved.

In March 1991, the desire for additional read-aloud books featuring braille and print and tactile/visual illustrations was repeated by members of the Braille Needs Assessment Committee. More storybooks featuring thermoforms of real objects and books corresponding to those used by young sighted children were requested by the group, who prioritized this as the first need under the area of materials to be developed. (Overall, materials development was prioritized as the third of four areas of need, following assessment and organizational skills.)

To address the need for additional tactile/visual storybooks for young visually impaired children, a second project of more limited scope was initiated in June of 1991. Four to six books designed to be read to a child by an adult reader will be created, or project staff will design adaptations of commercially available children's books.

Like the first set of tactile/visual storybooks, additional books will display braille and print text, providing exposure to the written word for both blind and low vision children and an appropriate medium for the adult reader, whether blind or sighted. Tactile and visual illustrations will be created to enhance the meaning and appeal of the books. Tactile graphics will be designed according to criteria established for the first set of tactile/visual storybooks; these criteria were based on tactile graphic research contained in the literature.

Work during FY 1991. Work on the project, itself, was begun in June of 1991, following approval of the project proposal. An examination of recently published children's books and classics for young children was begun in August.

Review of existing children's books has revealed some stories suitable for translation. In these cases, the story's text will be preserved and published in braille and print along with tactile graphics designed by project staff. Such translated books would be completely produced at the American Printing House for the Blind and probably would not involve use of the commercial book.

In addition, work on several original storybooks was begun by project staff. Information concerning contracts with free-lance writers was obtained and a list of possible writers was made.

Work planned for FY 1992. A meeting with Josephine Stratton is scheduled. She will serve as the project's major consultant. Approximately 12 storybooks will be proposed for development. A combination of recently published children's books, classics for young children, and original storybooks will be chosen. Tactile graphics for each storybook will be designed and sketched. The storybooks and accompanying sketches will be submitted to three consultants, who will advise project staff as to which are most promising. Six storybooks will be chosen for further development. Prototypes of these six will be made and evaluated by teachers and parents with visually impaired children from 2 years of age up to kindergarten level.

Infant Skills Project (continuing)

Purpose: To develop a collection of tangible child-use materials targeted for infants and toddlers, birth-24 months, and to develop accompanying written material useful by parents and teachers in developing critical skills in young children

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant  
Tobey Burton, Project Assistant

Background. The most recent Early Childhood Materials Needs Assessment meeting developed recommendations for specific early childhood educational materials research and development projects. The committee delineated and set priorities in several areas, with the Infant Skills project receiving a high priority rating. This high priority correlates with the emphasis at the federal level to initiate and strengthen infant/toddler programs throughout the United States under PL 99-457 and extended under PL 101-476.

Work during FY 1991. Several ongoing project activities continued and expanded. Staff continued to source and keep abreast of relevant literature to the Infant Skills Project. Literature surveys included areas such as child development, special education for young children, pediatric medicine, pediatric ophthalmology, family structure and development, service delivery options, physical therapy, occupational therapy, and exemplary educational programs and services. In addition, the agencies/services program databases, to be utilized in this project, were expanded and updated. The data from a teacher survey, querying teachers of infant visually impaired and blind children as to useful and needed educational materials as well as helpful resources and references, were utilized. These data served as an important basis for the collection of both APH developed educational materials and commercially available items that facilitate the development of critical skills in young visually impaired children. Specifications were developed and refined for the APH designed and developed materials to be included in the Infant Skills Kit.

Significant time was spent in reviewing materials, both commercially available and those developed by APH that would be useful in developing critical skills with young children whose vision is impaired. Over 100 materials were reviewed and evaluated for their applicability for the Infant Skills Kit. Of these initial 100 items, 50 were selected for the formative, evaluation. Project staff visited three programs serving some 150 infant/toddlers blind and visually impaired children and evaluated the materials in each program. APH personnel met with program staff who evaluated each of the 50 materials on a three-point scale. Program staff specialists included vision specialists, early childhood specialists, occupational therapists, physical therapists, and program directors. Program staff discussed their ratings with APH staff; in several cases, they kept the materials for an extended period of time to form more accurate impressions of the usefulness of the materials. After receiving all ratings, project staff posted the data and analyzed the results.

Subsequently, APH staff sourced the distributor or manufacturer of each item receiving a combined rating of 3, attempting to learn if the item will be available for some time. Project staff collected sets of materials for a comprehensive field evaluation.

Along with the tangible materials in the Infant Skills Kit, additional support materials will be included in the form of an activities manual for teachers. A second resource/support guide, the Parent Early Childhood Education Series developed by the early childhood staff of the Overbrook School for the Blind, will also be included. This series, described more comprehensively in a separate project report, entitled "Parent Early Childhood Education Series," was evaluated extensively by a number of experts in the area of early childhood vision. This series will also be offered for separate sale, without the accompanying Infant Skills materials.

Work planned for FY 1992. A comprehensive field evaluation of the Infant Skills materials and accompanying activities will be conducted after sourcing, obtaining, and collating multiple sets of all materials. Field evaluation sites will be contacted, and permission to participate will be obtained. An evaluation component will be designed; appropriate evaluation instruments, data collection forms, and questionnaires will be developed. Throughout the evaluation, staff will keep in contact with and monitor field evaluation sites. Field evaluation data will be posted and checked. An analysis will be made of these data, and revisions to the tangible materials as well as to the accompanying activities, will be determined. Staff will implement all revisions. Following final testing and any necessary revisions, all materials will be readied for introduction into the production pipeline. Production documents will be prepared and project staff will meet on a regular basis with production personnel. Project personnel will submit all tangible materials to U.S. Testing Company for safety evaluation. A final report will be written, detailing all aspects of project development.



Parent Early Childhood Education Series (continuing)

Purpose: To evaluate and revise a set of written materials useful in developing critical skills in young visually impaired children, targeted for parents and teachers

Project staff: Sheri Moore, Project Director  
Bernadette Kappen, Project Author and Codirector  
Karen Poppe, Project Assistant

Background. There is a documented need for specific training materials for parents and teachers of young blind and visually impaired children. Too often, parents are overwhelmed by a long booklet or book covering an array of topics. Experienced teachers of infant and preschool blind children developed the Parent Early Childhood Education series to provide concrete and discrete information in a variety of topical areas. These topical areas selected include those proven to be important to parents and experienced teachers working with young children with visual disabilities.

Work during FY 1991. The Parent Early Childhood Education Series is a set of written materials detailing suggestions, recommendations, and activities for working with visually impaired young children. This guide, developed as the Parent Early Childhood Education Series by Overbrook School for the Blind's early childhood staff, contains a great deal of excellent information. A wide array of relevant subjects are addressed in this series, including topics such as:

- General suggestions for infants with visual impairments
- General suggestions for the multiply impaired young child
- Terminology--words relating to vision impairment
- Developing eating skills, including general suggestions, spoonfeeding, cup drinking
- Promoting orientation and mobility skills
- Tactile stimulation activities
- Sensory development activities
- Developing vision skills
- Selecting equipment and toys
- Developing refine motor skills
- Positioning and movement
- Cognitive development
- Siblings and suggestions for family life
- Developing listening skills
- Parent-child interactions
- Developing language and communication
- Developing social skills
- Early parent-child interaction
- Socialization
- Stereotypic mannerisms--prevention and extinction

The Overbrook materials were reviewed and evaluated by APH staff as well as a group of external expert reviewers. A comprehensive evaluation form was developed to structure the response of the expert field reviewers. A great deal of data were generated by the expert reviewers in general areas such as general impressions of the usefulness of these materials; the population(s) of children/parents/professionals for whom these materials will be most appropriate; ways in which these materials could be improved; the usefulness and quality of the print and the graphics; topical/content areas to delete; content areas to be added; format and packaging possibilities for these materials; Are these materials appropriate for families with multicultural considerations?; and so on.

Content reviewers were also asked to individually evaluate each page of the Parent Early Childhood Education Series. Reviewers were requested to "grade" each page and write comments regarding specific suggestions for that page directly onto the copy. When all content/expert reviewers had completed their reviews, all data were posted, checked, and reviewed. Subsequently, all data were analyzed and a list of suggested changes to the materials was developed. Project staff then met with the Overbrook Project Codirector, and reviewed all recommendations for additions, changes, and deletions. Each suggestion was reviewed and considered; a final listing of all revisions was generated. A timetable was discussed for the completion of all revisions.

Project staff have coordinated all revisions of the Parent Early Childhood Education Series with the Overbrook Codirector. Overbrook staff have been involved in all phases of revising the materials. The Parent Early Childhood Education Series will be included as a component of the Infant Skills Kit as well as being made available for separate sale. All project materials have received a final review and editing from APH project staff. Overbrook staff are also involved in the final editing process.

Work planned for FY 1992. Project staff, both at APH and Overbrook, are in the final phases of review and revision. Each revision phase is being made via a desktop publishing process to result in a reasonably priced product to consumers. A number of illustrations are being modified or redrawn, so that all graphics "fit" into one style. Following all final revisions and editing, a production document will be developed prior to initiation into the production pipeline.

Preschool Learning Activities (continuing)

Purpose: To develop an instructional manual of functional/practical learning activities, appropriate for blind and visually impaired preschoolers, ages 3-, 4-, and 5-years old

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant  
Tobey Burton, Project Assistant  
Tom Poppe, Model and Pattern Maker

Background. APH has initiated the development of a continuum of educational materials for the 3-, 4-, 5-, and 6-year old age group. This is particularly timely, with many additional preschoolers being served through PL 99-457 and its extension PL 101-476. This specific project involves a manual of functional, varied, and numerous learning activities, specifically designed to make use of common objects in the development of a continuum of sensory skills and important concepts. Activities are designed to address skills that often require a great deal of practice, such as squeezing, pouring, sorting, categorizing, classifying, sequencing, and so on. The activities make use of environmental materials such as sponges, buttons, nuts, rocks, pennies, silverware, basters, water, marbles, magnets, beads, golf tees, cotton balls, and clothespins. Special consideration is given in the manual to learning experiences beneficial to young visually impaired children. In addition, all learning activities are also designed to foster integration experiences with sighted peers. To facilitate these experiences, a strong visual adaptations section is included with each activity.

Work during FY 1991. The Preschool Learning Activities manual title, which varies from the project title, is Hands On: Functional Activities for Teaching Basic Skills and Concepts to Visually Disabled Preschoolers. This extensive manual, numbering some 165 pages, is organized for providing ready access to a wide array of appropriate activities for visually impaired and blind preschool level children. Major components of the manual include: Introduction; Activity Section, including subsections of preliminary activities, dry transfer, wet transfer, stringing, folding, clipping, twisting, sorting, care of person, care of the environment, food preparation, work bench activities, art, and grace and courtesy; Ideas for parents/home activities; and Appendixes of hard-to-find items, suggestions for further reading, and references/resources. A series of molded ABS plastic trays have been specifically designed to facilitate the various activities included in the manual. The Hands On activity manual was formatively evaluated by eight local teachers or parents, familiar with programming for young blind and visually impaired children; results of this formative evaluation were integrated into a revised manual.

Following the formative evaluation revisions, an extensive field evaluation was conducted. The evaluation involved evaluating all of the 55 activities and the corresponding extensions designed to correspond with each activity. The format evaluated is summarized as follows:



|                    |   |
|--------------------|---|
| Materials          | - The necessary items.  |
| Earlier Work       | - Any activities that the child should have done first.   |
| Procedure          | - A description of how to show the work to the child.   |
| Points of Interest | - Anything that may capture the child's attention.  |
| Variations         | - Activities that are variations on the theme.  |
| Extensions         | - Activities using one or more of the materials in a completely different way.  |
| Language           | - Vocabulary building.  |
| Math               | - Counting or adding.   |
| Science            | - Using the material to help understand the natural world.  |
| Geography          | - Use of the material in learning about other countries or about water or land.   |
| Sensorial          | - Using any of the five senses.   |
| Art                | - Using the materials creatively.   |
| Music              | - Songs related to the activity or materials used in the activity.  |
| Books              | - Books related to the activity or the objects used in the activity.  |
| Games              | - Informal activities to promote socialization.   |
| Drama              | - Pretend play related to the activity.   |
| Problem Solving    | - Used to further the child's concept of the materials by asking questions requiring flexible thinking, or it is used as an extension for using the materials in a more open-ended way. |

The Hands On materials were evaluated in 10 programs for preschool visually impaired children. As teacher evaluations were received, staff recorded and reviewed all comments and recommendations. When all reviews were received, the data were posted, analyzed, and checked for accuracy. These data were used to determine revisions made to the manual of activities as well as to the trays used to facilitate activities. Following the completion of all revisions, the manual and trays underwent three final expert reviews, from preschool vision experts who have had no input into the project development or evaluation process. Additional revisions were identified through this process. Project staff made final revisions.

Work planned for FY 1992. All revisions will be incorporated into a computer disk in preparation for desktop publishing. Following final revisions, project staff will prepare a production document to facilitate production of the Hands On materials. Project staff will work with production staff on producing a high quality manual and trays. U.S. Testing Company will evaluate the trays. In addition, project staff will write a final report detailing all aspects of project development.



Early Childhood Microcomputer Applications (continuing)

Purposes: To familiarize staff with computer software designed for young children, to assess its applicability and/or adaptability for young blind and visually impaired children, and to consider development of a talking software program for young blind children

Project staff: Sheri Moore, Project Director  
Debbie Willis, Project Codirector  
Venus Elder, Project Assistant  
Microcomputer Group

Background. The increasing trend of working with young children and computers was discussed at the Fifth and Sixth Microcomputer Advisory Committee meetings. Specific to young blind children, it was determined that obtaining computer literacy early was a decided and necessary advantage. The advisory group recommended that APH staff should explore the use of computers with young totally blind children and, secondly, develop a beginning concept orientation talking software program for this specific audience.

Work during FY 1991. APH staff continued to attempt to keep abreast of the increased trends in microcomputer use with young children. Resource material and literature related to this specific topic were sourced and collected. Several pieces of early childhood software with possible application for young visually impaired children were reviewed. Also, specialists in early childhood vision, with microcomputer experience, regularly participate in the Microcomputer Advisory Committee meetings.

As a result of the deliberations at the Seventh and Eighth Microcomputer Advisory Committee meetings, work on developing a talking software program for young blind children was postponed. The Committee discussed an array of projects related to the needs of blind students and microcomputer access, and determined that there were other areas of more pressing need for APH to expend its fiscal and staff resources. More specifically, a project to develop software with a high interest/low vocabulary emphasis received priority.

Consistent with the committee's interest in having APH staff continue to monitor and keep abreast of developments and trends in microcomputer use with young children, a number of site visits were made to local educational programs using microcomputers with young children, and APH staff attended local workshop highlighting the adaptive Firmware Card. A number of microcomputer programs were specifically targeted for review and observation, including the IBM Writing to Read series. Along with Writing to Read, the companion programs of Get Set (preschool level) and the new TLC program (2nd to 6th grade) were observed. The TLC program, produced by IBM, stands for teaching, learning, and computing.

Work planned for FY 1992. Printing House staff will continue to monitor developments and trends related to the use of microcomputers and young blind and visually impaired children. Several staff members collaborate in this specific area and share information among themselves and teachers from the field seeking information from APH.

The specific software project in early childhood is presently "on hold" as recommended by the Microcomputer Advisory Committee.

Early Childhood References and Resources and Low Vision References and Resources (continuing)

Purpose: To research recent literature relevant to young blind and visually impaired children and to develop a resource list of such references; to research recent literature relevant to working with low vision individuals and to develop a resource list of such references

Project staff: Sheri Moore, Project Director  
Karen Poppe, Project Assistant

Background. A selected bibliography of recent early childhood vision literature was prepared for the Printing House's 1987 Annual Meeting of ex officio trustees. At the same time, several other early childhood special education resource listings were also compiled and distributed including: professional journals, curricula, general references, and assessment tools. These resource materials have continued to generate considerable interest and requests from vision professionals.

Work during FY 1991. Because of the continuing demand for these resource and reference materials, the selected bibliography of early childhood literature, specific to blind and visually impaired children, has been refined and updated annually. The updated bibliography contains nearly 175 references, most being written in the past 7-8 years. The revisions have been annually made prior to annual meeting, with copies available at no charge upon request.

In addition, a second bibliography was researched and developed entitled Developing Visual Efficiency. This selected bibliography contains some 200 references relevant to the important topic of developing visual efficiency in low vision learners. These materials continue to be available as a service, upon request, to Printing House consumers. Staff have received a number of letters and phone calls commenting on the usefulness of these reference and resource lists. One state reported that it has sent copies to all vision professionals working in the state.

Work planned for FY 1992. Project staff will continue updating both reference/resource lists on an annual basis. As before, both lists will be available upon request at no charge via mail or phone.

Parents and Visually Impaired Infants (PAVII) (continuing)

Purpose: To provide resource and reference materials useful in developing individualized intervention programs for infants and young children with visual impairments, target age birth through 2 years

Project staff: Sheri Moore, Project Director, APH  
Deborah Chen, PAVII Author  
Fred Otto, Editor  
Karen Poppe, Project Assistant and Editor  
Gail Cavello, PAVII Author  
Clare Taylor Friedman, PAVII Author

Background. The PAVII materials were developed through a federally funded project administered through Blind Babies Foundation in San Francisco, California. Materials developed through the 3-year project are targeted for parents, early interventionists, and special educators providing home-based services to families with visually impaired infants. There are six print booklets comprising project materials, each with several sections as follows:

1. The Parent Assessment of Needs (PAN). An ecological inventory or interview/report form which helps parents to identify home-based goals and prioritize objectives for their infants.
2. The Parent Observation Protocol (POP). An instrument for using a video "microteaching" format in parent-training. The format encourages parent observation of self and child, as well as identifies teaching priorities and strategies for facilitating early learning experiences.
3. PAVII "How-To" Papers on Assessment. This is a series of papers for home-based assessment of infants and toddlers who are visually impaired.
4. The Art of Home Visiting. A paper which discusses roles/responsibilities and prerequisite competencies for a home visitor. It also offers practical suggestions for a home visit and issues encountered in the home visit process.
5. Getting Ready for School. A paper for parents considering preschool programs for children with visual impairments. The paper discusses the learning environment, family factors, child factors, school district factors, expert input, and educational rights.
6. Learning Together: A Socially-based Curriculum for Infants and Toddlers with Visual Impairments is a parent guide of home-based strategies for daily routines which integrate cognitive, social, communication, motor, and perceptual skills. The guide includes a brief discussion about the parent's role as "teacher," the home as a primary learning environment, and suggestions for typical routines such as meal time, bath time, bedtime, play time, and going out.

Work during FY 1991. Printing House staff and a desktop publishing consultant have completely reformatted all PAVII materials. The process,



although initially time consuming, will simplify future modifications and revisions. The desktop publishing process has enabled APH to price the PAVII materials very reasonably. APH staff have worked collaboratively with the desktop publishing specialist to ensure a quality product. The editing process was also performed by APH staff. Printing House research staff worked closely with APH production personnel throughout the production phase.

Work planned for FY 1992. Several activities remain before completion of the PAVII project. APH staff will write a comprehensive report of the development of the Parents and Visually Impaired Infants materials. Project staff will also likely conduct several workshops on the use and application of these new products. APH staff will also continue longterm monitoring of the PAVII materials content, and upgrade, improve, and revise as necessary. The revised activities will be done in collaboration with PAVII authors. Project staff plan to continue to have a close, collaborative relationship with the PAVII authors.

## Classroom Calendar Project (completed except for final report)

Purpose: To develop a classroom calendar with both print and braille particularly for use with preschool and primary level visually impaired children

Project staff: Eleanor Pester, Project Director  
Karen Poppe, Project Assistant  
Tom Poppe, Model and Pattern Maker

Background. During visits to both preschool and primary classrooms for the visually impaired in May of 1988, both calendars and activities centered around them were observed. The calendar seemed to have the potential for being a useful educational tool, but required adaptation to be meaningful for both large type and braille readers. Some busy teachers did not take the time to adapt a calendar, and some of the calendars which teachers had adapted were rather unattractive. The solution seemed to be to develop a large type/braille calendar for classroom use.

A market search was conducted to see calendars available for regular classroom use, and several sample calendars were obtained. Possible methods and materials for making the calendar were explored and a list of possible symbols was compiled. A prototype was developed and a planning document and time line were written.

The project was presented to an in-house committee and discussed. Following the in-house committee meeting, questionnaires were developed and sent to nine reviewers. When all nine questionnaires were returned, data were analyzed, and objectives and suggested activities were compiled.

Based on this information, recommendations were made for the production of (1) a classroom calendar with moveable braille/large print labels and attractive visually/tactually distinguishable symbols for holidays, etc., (2) individual monthly calendars with large type/braille number stickers, and (3) the present APH braille calendar with minor revisions. A report was written and distributed to the in-house committee for comment before proceeding.

Next prototypes of both the classroom calendar and the individual calendar were prepared and placed at 10 sites for hands-on evaluation.

Work during FY 1991. Data from the evaluations were analyzed and only minor revisions which could be made for production without further formal field testing were indicated. Specifications were written for the production of all three calendars. Specific changes were made in the 1991 APH Braille Calendar to make it more useful for children in the primary grades and beyond. It was also advertised in the latest instructional aids catalog which resulted in increased sales. The Classroom Calendar Kit and the Individual Calendar Kit were turned over to production and are expected to be available by 1992.

Work planned for FY 1992. A final report will be written.



Multihandicapped





### Making Picture Recipes (new)

Purpose: To evaluate a manual demonstrating how to make and implement a picture recipe system with nonreading multihandicapped low vision students

Project staff: Sheri Moore, Project Director  
Tobey Burton, Project Codirector  
Mary Zatta, Project Author  
Diane Furino-Bleier, Project Author

Background. The purpose of the Picture Recipe program is to provide a means of developing cooking independence for the low language students who are non or beginning readers. This curriculum originated from needs within The Perkins School for the Blind. Teachers found that as the students became adolescents, daily living skill instruction and preparation for future placements into community living warranted the presentation of cooking instruction. There was no formal curriculum developed to address the needs of adolescent students who were non and/or beginning readers. It was this situation which prompted the development of this picture recipe cooking program.

In evaluating other materials, many of the commercial materials researched were found to be inadequate. In some materials, pictures were too small for visually impaired students/clients. In other materials, the presentations were visually confusing or too complex for students/clients with perceptual and/or learning problems. Another drawback to using commercial picture recipes was the the amounts listed were not easily adapted. Through trial and error with various techniques, a method was developed that could easily be used in a variety of educational and residential settings and could accommodate various sized groups.

The program includes a manual with easy, how-to directions; sample recipes formatted in two different ways; corresponding checklists for assessment; and helpful hints for adaptations. Also included is a master set of reproducible picture cards with which to make recipes. The master set of picture cards is organized in the following categories: food items, utensils, processes, appliances, miscellaneous.

Work planned for FY 1992. APH staff will review and refine the materials along with the authors, prior to a content evaluation by several expert reviewers. Project staff will develop an evaluation system that facilitates the evaluation of the Making Picture Recipe program. The results of the evaluation will determine future project directions.

Multihandicapped Adolescent Project (continuing)

Purposes: To develop a manual of functional and community-based learning activities designed to meet the needs of adolescent multihandicapped visually impaired students, and to develop and evaluate several tangible materials useful in fostering independent functioning in adolescent multihandicapped students

Project staff: Sheri Moore, Project Director  
Martha Majors, Project Codirector  
Mary Zatta, Project Codirector

Background. The Multihandicapped Adolescent Project is targeted for students who have achieved basic skill levels and are involved in an educational program emphasizing self-care, independence, and life/community living skills. Written activities include functional and age-appropriate applications, stressing skills useful in a community-based setting. Applications of functional academics are also incorporated into project activities.

Work during FY 1991. Project staff continued to keep abreast of literature and educational materials in the area of functional and community-based instruction. Project materials were formatively evaluated. Numerous and significant additional activities have been written for the project. The majority of these activities have been formulated and designed by experienced teachers of multihandicapped, visually impaired adolescent level students. Activities cover a wide array of practical, functional program areas, and stress the importance of developing independence, self-sufficiency, functional skills, and community living/life skills. The format for the presentation of the activities has been redesigned, with the objective of presenting information in a more concise and useful format. The revised format includes an overall rationale for using a functional curriculum, with an emphasis on practical activities that help students to generalize information. A main curricular area, such as community experience, is detailed, along with subtopics and specific activity suggestions. For each of these subtopical areas, further activity suggestions are given in areas such as functional reading and math; manipulative experiences; group/socialization applications; language/communication; sensory experiences; and extensions in areas such as cooking, art, music, dramatic play, etc.

Work continued on refining activities and adding additional teaching suggestions to the program. The project director worked in cooperation with several teachers of multihandicapped visually impaired students and teachers of Deaf-Blind students at Perkins School for the Blind. These teachers have formatively evaluated and reviewed the project materials, used the suggested activities in their classrooms, and have developed additional "teacher tested" activities for inclusion in the Multihandicapped Adolescent Project materials. The project director continued to work closely with Martha Majors and Mary Zatta, who are coordinating the contributions of the Perkins staff.

Work planned for FY 1992. Following refinement of the activities by the project authors, the complete set of materials comprising the Multihandicapped Adolescent Project will be field evaluated. Staff will work to make contacts with appropriate programs, and will secure any needed permissions to participate. Typically, staff will contact both program supervisors as well as classroom teachers who will be evaluating the materials on a daily basis. Project personnel will also construct an evaluation that will comprehensively address all aspects of the materials to be tested with the Multihandicapped Adolescent Project. Data from the evaluation will be posted, analyzed, and revisions will be determined. Preparations will then be made for the writing of a production document for use with the first production run of these materials. Staff will continue to monitor the project through the production phases, and will also complete a final project report.



Pragmatic Classroom Units for Young Multihandicapped Children (new)

Purpose: To evaluate a curriculum model, presented in a variety of classroom units format, that assists teachers of young multihandicapped visually impaired children in developing a methodology and practical approach to teaching, with a particular emphasis on the development of communication

Project staff: Sheri Moore, Project Director  
Wendy Drezek, Project Author and Codirector

Background. The Pragmatic Classroom Units were developed by Dr. Wendy Drezek to accompany a curriculum model based on the work of Ellyn Lucas-Arwood. Pragmatism is a methodology for facilitating communication for children with language disorders. In this model, language has a social and cognitive base, and is shaped by consequences in the environment; language is only successful insofar as it results in the intended change in the environment. In the classroom, routines are used to structure a common meaning, units are used to introduce new concepts and vocabulary, and "boobytrapping" is used to force the need to communicate. Sing language and other nonvocal techniques are used with nonvocal and echolalic students.

The units can be used in several ways. They provide content and extension activities for individual lessons. The pages can be reproduced and sent home to parents to structure home carry-over. The skills/concepts/vocabulary portion can be used to monitor progress and achievement. Skills, concepts and vocabulary appear in multiple units. The initial appearance of the skills, concepts, and vocabulary are usually at a very concrete level (example: orange pumpkin) with a later occurrence at a more abstract level (example: sort colors). The purpose of the units is to present skills/concepts/vocabulary in a rich context of real objects and actions, rather than as isolated splinter skills.

Lists of units include: school, me, leaves, mask, hat, bag, candy, pumpkin, corn, potato, apple, cranberry, turkey, cookie, present, tree, fruit, vegetable, bread, drinks, snacks, dessert, shape, valentine, spring, egg, animals, bathroom, kitchen, tools/household objects, music, toys, art, books, texture/touch, size/measure, space/time, color/shape, letters, numbers, community helpers/vehicles, community activities, summer, weather, dinosaurs, dragons and monsters, stories.

Work during FY 1991. Materials were studied and received by APH staff. Information and data were gathered from the author related to the evaluation of the Pragmatic Classroom Unit materials in several sites in Texas. In addition, data were gathered regarding the use of the classroom unit materials in several workshop/training sessions in Texas. Project staff worked closely with the author to ready the materials prior to their expert review. Project staff also developed an evaluation form for use by the expert reviewers to critique the Pragmatic Classroom Unit materials.

Work planned for FY 1992. The classroom unit materials will be evaluated by a group of expert reviewers and content materials. APH staff will make necessary contacts and monitor the review process. Project staff will develop an appropriate evaluation system and accompanying forms. All data will be posted, checked, and analyzed. Based on the expert reviewers' data, a decision will be made about the need for additional evaluation and/or publication of these materials.

Task Oriented Inventory and Work Skills Program (formerly entitled Effective Use of Objects: A Process Centered Intervention) (completed)

Purpose: To provide a program that will assess and include work skills activities for a process approach toward task oriented behavior with objects

Project staff: Bill Duckworth, Project Director  
Fred Otto, Project Assistant  
Suzette Wright, Project Assistant  
Gretchen Stone, Project Author

Background. The Austin Work Skills Evaluation, from the Texas School for the Blind, was found to offer a great deal of excellent material for programming with young visually impaired students with developmental delays as well as the moderately to severely multihandicapped student. In working with the author, however, it was found that many of the ideas could be expanded and the program could include information for various populations of visually impaired students. The program developed to be more nearly a process of concept development for the limited student or the student with limited experiences than it was a program that led directly to vocational training. With the wide range of the population needing prevocational training, it is natural that various professionals within this range were critical of doing a program for any one group of this population. This criticism was beneficial as it gave the project staff and the author other aspects to consider in revising the material. The program remains, however, a process of handling materials in a way leading to task-oriented behavior and the development of work-related concepts which will serve as a basis for more specific training.

Work during FY 1991. In FY 1990, a major redesign of the format of the materials was made plus inclusion of refinements and explanations of many of the concepts. An experimental edition was distributed for field evaluation to nine sites in March 1990. Pending final revisions, the program was approved for production in June 1990. In FY 1991, a final edition of this program was developed using information from the field evaluation. The edition is made up of two volumes which include an inventory at two levels of ability with a programming guide at the lowest level. The first volume deals with the exploration of physical properties of objects and the second volume stresses task application and productivity. The program was published on January 30, 1991.

Low Vision





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Assessment Program and Intervention Guidelines for Visually Impaired Children  
(new)

Purpose: To evaluate the University of California Berkeley (U.C. Berkeley) Assessment Scales for Visually Impaired Children, and to determine their applicability for use with teachers of young visually impaired children

Project staff: Sheri Moore, Project Director  
Amanda Hall, Project Author and Codirector  
Linda Kekelis, Project Author

Background. The U.C. Berkeley Assessment Scales for Visually Impaired Children were developed under a grant from the California State Department of Education. The overall goal of this project was to refine the scales through pilot-testing with a small number of blind and low vision children in the San Francisco Bay Area. The scales examine developmental milestones of particular importance to children with vision loss between birth and 2 years of age and address the following domains:

- social/emotional development
- language development
- cognitive development
- gross motor development
- functional vision
- home environment

For this project, (a) the scales were pilot-tested with 12 infants on the register of the Variety Club Blind Babies Foundation, (b) test items were refined for each of the scales, (c), a record-keeping system was developed for the scales, (d) preliminary developmental data for visually impaired infants between birth and 2 years were collected, and (e) inter-rater reliability for scoring of the scales was determined.

Work planned for FY 1992. The Assessment Scales for Visually Impaired Children, along with the accompanying guidelines component, were reviewed by APH project staff. The program and guidelines also will be reviewed by several expert reviewers. Printing House staff will develop an evaluation plan and will make all necessary arrangements to implement the plan. Data will be posted, checked, and analyzed to determine future project directions. All activities will be coordinated with the two project authors.

Potential Assessment of Visual Efficiency (continuing)

Purpose: To develop an assessment instrument useful in evaluating the potential for visual efficiency of young children and young children with multiple impairments, in addition to a visual disability

Project staff: Sheri Moore, Project Director  
M. Beth Langley, Project Author and Project Codirector

Background. M. Beth Langley, author of the Functional Vision Inventory, has developed an instrument specifically designed to measure visual potential for visual efficiency in visually impaired multiply handicapped children. This new instrument is entitled The Potential Assessment of Visual Efficiency.

Work during FY 1991. An array of literature in several disciplines has continued to be sourced, surveyed, and integrated into the assessment. Journal articles were read and incorporated in disciplines including developmental medicine, child neurology, ophthalmology, pediatrics, brain research, pediatric ophthalmology, physiological psychology, psychology, low vision, developmental disabilities, and child development. In addition, a number of modifications and refinements continue to be made to the instrument. Pull out sections, useful in evaluating certain children, were designed and incorporated. Section examples include cortical visual impairment and procedures for working with very young children.

The basic format of the assessment is as follows:

Demographics  
Physical readiness  
Medication  
Time of assessment  
Seizure activity during assessment  
Reaction to handling  
Posture and movement components  
Structural status  
Vision structure and function  
Orientation and mobility  
Functional use  
Physiological status  
Visual behaviors  
Gaze  
Eye movements  
Visual fields  
Cortical visual impairments status  
Acuity  
Levels of stimuli and responses  
Stimuli processed  
Response patterns  
Visual perception

Summary and impressions  
Current level of visual functioning  
Visual variables  
Skills to be developed and/or refined

The format has been modified and enhanced with the goal of making it easier to use and rate. A great deal of work has also been done in writing directions for use of the instrument. These directions are very comprehensive and detailed. A formative evaluation was conducted of the Potential Assessment of Visual Efficiency. Revisions were made to the assessment, based on the results of the formative field trial.

Work planned for FY 1992. Strong consideration will be given to the inclusion of a materials component. An additional field evaluation will be arranged and conducted incorporating both content/expert reviewers and teachers. Staff will make arrangements for this field evaluation and will also design needed evaluation forms. The results of this evaluation process will be used to revise and improve the Potential Assessment of Visual Efficiency prior to its entry into the production pipeline. Appropriate production documents will be prepared to facilitate the production of this instrument.





Braille



Read Again: A Braille Program for Adventitiously Blinded Print Readers  
(completed except for final report)

Purpose: To develop a set of materials designed to teach braille to persons who lose their vision after initially learning to read print

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Eddy Jo Bradley, Directing Editor  
Fred Otto, Assistant Editor  
Karen Poppe, Project Assistant

Background. A complete set of materials was designed to teach braille reading to persons who lose their vision after initially learning to read print. This set of materials was reviewed by the project's consulting committee. Pending revisions, the program was approved for production by APH's Publications Committee. Revisions of two of the beginning levels introducing braille letters, numbers, and basic punctuation were made and the levels were again reviewed by the committee. Following this meeting, these levels were once again revised to reflect the committee's suggestions, completing work on the part of the program dealing with Grade 1 Braille.

Then the part of the program dealing with Grade 2 Braille was revised and new reading applications were selected, copyright permissions were secured, and some readiness materials of special relevance to the target population were written. The entire program was copyedited and content problems were cited. The research staff met together, reviewed the entire program, and made decisions about the problems that had been cited. Following this meeting, further copyediting was done based on decisions the group had made. Additional practice materials available from APH were referenced.

Detailed specifications were written for brailling and one copy was marked up for recording. Level A was brailled on plates and the decision was made to wait until typesetting was completed before continuing with brailling and recording. All levels were marked up for typesetting by Eddy Jo Bradley. The research staff worked with the typesetter to produce satisfactory galleys. The galleys for all the levels were dummied up, artwork was added, and front matter was completed. Proof copies of the entire program were returned from the typesetters and checked and double checked by the research staff.

The research staff continued to work closely with the production staff to prepare Read Again. Level B was recorded. Levels B through I were brailled, proofed, corrected, and put on plates.

Work during FY 1991. Final corrections in the typesetting based on changes made during brailling were completed. Production of Read Again was completed and the program became available in February 1991. Two studies also grew out of this project--a survey of the adventitiously blind enrolled in braille instruction and research on optimum braille size and spacing for



initial braille instruction. An article based on the survey which had been submitted for publication previously was revised and an article on braille size and spacing was written. Both articles were submitted for publication.

Work planned for FY 1992. The two articles mentioned have been accepted for publication in RE:view and should be published during this year. A final report on the project will be written.

## Braille Language Program (continuing)

**Purpose:** To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

**Project staff:** Hilda Caton, Project Director  
Eleanor Pester, Assistant Director  
Karen Poppe, Research Assistant  
Eddy Jo Bradley, Directing Editor  
Eric Hamp, Linguist

**Background.** This project was partially funded under a grant awarded to the APH by the Federal Research in Education of the Handicapped Program's Field Initiated Research competition which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, U.S. Department of Education. The resulting product has been approved for production.

Work began on the project in January 1984. Information on achievement in language, spelling, and word study skills was obtained through administration by teachers of a special braille edition of the Stanford Achievement Test, Intermediate I, Form E to 57 blind 4th and 5th grade students to identify specific problems. Analyses were made of current spelling and English textbooks and of Patterns: The Primary Braille Reading Program. This information was used to develop the program.

The program consists of four levels, A through D. Each level of the program was drafted, reviewed, revised, and sent to pilot test sites for evaluation. Then the consulting committee met and reviewed the materials. Further revisions were made based on these evaluations.

These materials were then placed with over 50 students and approximately 20 teachers at field test sites across the country. Annual visits were made to the sites to explain the field evaluation procedures, to check on progress, and to observe the materials in use. Criterion-referenced tests were administered as the children completed each level. Test results were sent to APH for scoring and analysis.

Federal support for the project ceased December 31, 1989, at the end of the project's 5th year, but field testing of the materials continued with new materials sent to the field test sites as students were ready for them. Revisions of the materials based on the field evaluations proved to be extensive.

**Work during FY 1991.** All field test sites were contacted during this school year and visits were made to teachers in Colorado and Tennessee who were new reviewers. At this time, 9 teachers in six states were still working with 9 students on Level C and with 17 students on Level D. Production

specifications for Level A were written and final copy editing and correcting of Level A were completed. Level A was marked up for typesetting. Forty-five lessons on Level B were revised.

Work planned for FY 1992. Levels A and B materials will be produced and will be ready for distribution and use at the beginning of the 1992-93 school year. Since the majority of the students involved in the field testing are through with Level C, plans are to proceed with final revisions of Level C as soon as Level B production preparation has been completed. Field testing of Level D will continue during the 1991-92 school year with 13 students and 7 teachers.

## Grade 2 Braille Cards (completed)

**Purpose:** To develop a set of cards with Grade 2 Braille units on one side and the Grade 2 Braille equivalent on the other side to be used with adventitiously blinded teenagers and adults who are learning braille or with younger braille readers who have been introduced to braille but need identification or spelling practice

**Project staff:** Eleanor Pester, Project Director

**Background.** This product was first conceived in 1987 when plans were underway to expand the Dolch Word Cards. Teachers of braille from both schools and rehabilitation centers who were questioned felt that such cards would be useful for their students. Grade 2 Braille Cards were approved for production at the annual meeting in October of 1987. No further research on this product was anticipated since the braille units themselves were set and a similar format to that for the Expanded Dolch Word Cards would be used. Work on this product was expected to begin soon after work on the Expanded Dolch Word Cards was completed. When specifications for production of the Grade 2 Braille Cards were being written, questions arose concerning what to include to make this product most useful. To get input from braille teachers to determine the final specifications for this product, a brief questionnaire was developed and sent to nine braille teachers with experience working with the target population. Information from the seven completed questionnaires was used to write the final specifications for this product. Then, although work on this product was thought to be complete, it ran into a snag in production. When the print sheets for the cards were being run through the braille presses, a copy of the cards was pulled and sent to the research staff for approval. Examination showed that a number of the dots on this copy were weak and some were squashed. This was attributed to the paper which seemed to be wearing out the braille plates even though it was the same kind that had been used previously for the Expanded Dolch Word Cards, but from a different producer. To remedy this situation, braille samples were produced on a number of different papers which were then judged to be acceptable or unacceptable and ranked for acceptability by four braille experts. Five hundred copies were made of the two most acceptable papers and copies #1 and #500 were compared for effects of plate wear by the same four experts. Both were judged to be generally acceptable, but there still seemed to be some problems where corrections had been made in the plate or where interpoint dots fell very close together.

**Work during FY 1991.** Work to produce a quality product continued with the review of proof copies. The Expanded Dolch Word Cards were approved and successfully run early in the year, but the quality of the braille on the Grade 2 Braille Cards continued to be a problem. In an effort to strengthen the dots on the braille plates used for printing, new plates were brailled which, for the most part, did not use interpoint braille. This seemed to produce satisfactory braille and production was completed.



Braille Line Length Study (discontinued)

Purpose: To compare reading speed and accuracy under three conditions--(1) paper with 40 cell lines, (2) paper with 20 cell lines, and (3) VersaBraille with 20 cell lines

Project staff: Eleanor Pester, Project Director  
Joe Petrosko, Design and Evaluation Specialist  
Karen Poppe, Project Assistant

Background. With the advent of paperless braille devices such as VersaBraille, the question of the optimum length for a braille display has arisen. At the present time, cost is a prohibiting factor, limiting the length of the display line. However, if a longer line was found to be sufficiently superior to the 20 cell line in general use, the increased cost might be justified. As technology and cost become less limiting factors, line length becomes an important question. Surprisingly, a review of the literature has turned up no research on this question.

A study comparing reading speed and accuracy of experienced adult VersaBraille users under the three conditions described in the purpose was designed. Three passages of approximately 500 words each and of comparable difficulty and interest were selected for this rate study. The Cloze Technique, how it relates to visually impaired persons using braille, and the variation used in the reading rate test where subjects are asked to identify words that do not belong as they read were investigated and were applied to the test material for a broad check of comprehension.

Before the test materials could be prepared, a survey was conducted to determine whether participants use the older VersaBrailles which use cassettes or the newer ones which use disks and whether participants are familiar with the IRS code, the newer BANA code, or some other code. Telesensory Systems, Inc. furnished a list of VersaBraille users who were surveyed and from which the subjects for this study were expected to be selected. The questionnaire was prepared in both braille and print and sent to VersaBraille users in five states. Only 34 VersaBraille users responded to the survey indicating their willingness to participate in this study.

Work during FY 1991. Although efforts were made to locate a sufficient number of suitable subjects for this study, only a small number of scattered subjects were located making travel for testing costly. Test materials would also be costly since potential subjects used a variety of codes and VersaBraille equipment. Since technological developments with paperless braille displays, which seemed to warrant this research, have not to date lived up to their potential, the decision was made to discontinue this project.

Work planned for FY 1992. A final report will be written to document the work which was done on this project.

Linguistic Analysis of American Literary Braille, Grade 2 (continuing)

Purpose: To conduct a thorough and systematic linguistic analysis of American Literary Braille, Grade 2, which will incorporate the new braille terms developed for Patterns: The Primary Braille Reading Program

Project staff: Hilda Caton, Project Director  
Eric Hamp, Linguist  
Karen Poppe, Project Assistant  
John Siems, Data Analyst and Computer Programmer, APH

Background. No systematic analysis of American Literary Braille has been conducted. The British have completed a major contraction study of their system which includes frequency of occurrence of braille contractions in written text. That study, however, did not consider a grouping of braille configurations (contractions) which was different from the groupings now in use. This linguist analysis of American Literary Braille is somewhat similar to the British study except that it uses the new terms (groupings) used in the braille reading and language programs developed at APH and will extend the analyses to areas not included in the British study. The basic plan included the following steps:

1. Selection of appropriate text materials for the analysis
2. Marking (or bracketing) of the braille configurations defined in Patterns: The Primary Braille Reading Program
3. Counts of the frequency and order of occurrence of those elements in the text materials
4. Revision of the order and groupings of braille rules in the publication English Braille: American Edition 2 with an emphasis on more effective orders and groups for teaching purposes
5. Publication of various types of materials to assist in the teaching and learning of braille

Some of the text materials were selected and the analyses begun. These text materials consist of 25 samples from the corpus which forms the basis of the publication, Computational Analysis of Present-Day American English (Kucera, H., & Francis, W. N., 1967), generally known as the Brown Corpus. This publication contains 1,014,000 words and consists of 500 samples each of about 2,000 words, taken from contemporary publications in American English. The 25 samples used in the analysis are representative of all types of literature in the Brown Corpus.

The computer translation of the selected samples from the Brown Corpus was completed, printed, and proofed. The line by line marking and counting of all braille units, contractions, composition signs, punctuation, and numbers (alphabetic and numeric) continued and some preliminary results were tabulated. The marking and counting of various other types of braille units continued (i.e., the frequency of occurrence of certain braille units which occur in several different forms depending upon where they occur in a line,

next to punctuation, etc.). Further analyses were made of the braille units already identified and a report was written describing the completed part of the analyses and the implications for teaching and learning of the braille code.

Work during FY 1991. Counts of all braille units--letters (alphabetic and nonalphabetic), grams, punctuation, and registers--were completed line by line for each of 25 articles and a total of all 25 articles combined. Eric Hamp, John Siems, and Hilda Caton collaborated on, and completed, what will be the first of several articles based on data resulting from this study.

Work planned for FY 1992. The following analyses will be completed:

1. lower signs (written vs. contracted) and spacing
  - a. incidence of word to
  - b. incidence of words by, be, his, was, were, enough, into, in
2. correlations with print in length (e.g., mother is a six letter word in print and a one cell contraction in braille)
3. count of logograms, phonograms, and morphograms
4. capitalization study for comparison with British braille

### Adult Braille Writing Program (continuing)

Purpose: To develop an instructional braille writing program for adults with both slate and stylus and braillewriter components

Project staff: Hilda Caton, Project Codirector  
Eleanor Pester, Project Codirector  
Eddy Jo Bradley, Materials Developer  
Betty Wommack, Materials Developer

Background. To provide a truly comprehensive program in braille instruction for adults, it is necessary to teach students how to write as well as how to read braille. There is very little research available on braille writing for either children or adults. A survey done by Lowenfeld, Abel, and Hatlen (1969) reported that braille writing was usually introduced to children at the same time as braille reading and that the braillewriter was usually used to teach braille writing. No other research is available on braille writing instruction. This includes research on the use of the braillewriter and the slate and stylus for children or adults.

From the time planning for Patterns: The Primary Braille Reading Program and Read Again: A Braille Program for Adventitiously Blinded Print Readers began, the need for formal braille writing instruction was recognized. An introduction to the use of the braillewriter for children was written as part of the Braille Language Program. This could be revised for use with adults. Also, during the past few years several slate and stylus programs for children and adults have been developed. A review of these showed that a program by Betty Wommack most closely corresponds to the philosophy of slate and stylus instruction which has been developed at APH. Betty Wommack has been contacted and is willing to assist in preparing this program for adults. The completed program would consist of a braillewriter and slate and stylus program.

Work during FY 1991. Hilda Caton and Eleanor Pester met with Betty Wommack, the author of an unpublished slate and stylus program for children, whose philosophy they endorse, and discussed changes that would be needed to use this program with adults. Betty Wommack then revised the program based on this discussion. The possibility of developing a device with pegs which could be pushed from one side to the other in about 10 cells to simulate writing and then reading braille on a slate was explored with Tom Poppe.

Work planned for FY 1992. Betty Wommack's revision of the slate and stylus program will be reviewed and revised and/or expanded as needed. Tom Poppe will develop the slate and stylus device. The introduction to the braillewriter from the Braille Language Program will also be revised so that it is appropriate for use with adults. The Swing Cell will be used with this part of the adult braille writing program.



Development of Guidelines for Literacy: Selecting Appropriate Learning Media  
(continuing)

Purpose: To develop a set of guidelines/criteria to assist teachers in selecting the primary reading medium or media for visually impaired students with some remaining vision

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Project Associate Director  
Karen Poppe, Project Assistant

Background. At the present time, a great deal of attention is being given to the overall question of developing literacy in visually impaired children. Literacy, the ability to read and write, is a prerequisite to communicating appropriately, competing effectively, and ultimately, attaining success in life. Many persons, both consumers using braille and service providers who teach or produce materials themselves have become concerned that the number of braille readers and writers in the United States is decreasing and they believe that many visually impaired children are not receiving adequate (or any) instruction to aid them in becoming truly literate adults. In particular, it appears that many children who have some remaining vision are not being provided the opportunity to learn braille. Guidelines are needed for the selection of appropriate learning media for visually impaired children who do not fit neatly into the categories of braille or print users. Obviously students with mild vision losses will use print and students who are totally blind will use braille.

APH's Educational Research and Development Committee requested APH bring together national experts in this area to develop a set of guidelines, or criteria, to assist teachers, parents, paraprofessionals, and others who are directly responsible for determining which children should use braille as their primary learning medium. Also, the guidelines will address when the instruction in braille for children with degenerative eye conditions should begin.

A committee meeting was held at APH on June 8-9, 1990, to develop the guidelines. A decision was made to write and publish the set of guidelines if a consensus was reached at the meeting and, if no consensus was reached, a detailed report of the meeting would be published.

Work during FY 1991. A document was developed resulting from the June 1990 meeting. It was initially drafted at the meeting, then put together and sent out to the Committee for review. Revisions were made from comments received and the document was once again sent out for review. A final draft was developed following final review. It will be published as Print and Braille Literacy: Selecting Appropriate Learning Media. The document will contain information pertaining to the major principles which should be understood, suggested areas for assessment and evaluation, and guidelines for decision making in the selection of a learning medium or media for visually impaired children. In addition, it will provide annotated bibliographies of

selected resources, references, statistical data, a list of functional vision assessment instruments, and other information related to this critical problem.

Work planned for FY 1992. The final draft of this document will be completed and published in regular print, large type, and braille editions.

Braille Needs Meeting (completed)

Purpose: To determine priorities for future research and product development in braille

Project staff: Hilda Caton, Project Codirector  
Eleanor Pester, Project Codirector

Background. Since many of the braille research and development projects being conducted by the Department of Educational and Technical Research are nearing completion, it is necessary to begin planning for future projects. There are many research needs in this area and, in order to meet the most critical needs, it is desirable to form a committee of persons who are working directly with children and adults who use braille as their learning medium to determine priorities for future projects.

Work during FY 1991. A committee meeting was held at APH on March 8, 1991, to identify braille research and development needs and to determine priorities for attempting to meet these needs. Results of this meeting were a number of projects identified in four major areas. Prioritized for implementation, these areas were (a) assessment, (b) organizational skills, (c) materials development, and (d) basic research. A report detailing the results of this meeting and listing specific projects in these areas has been written and is available for future reference.

Press Braille Paper Study (new)

Purpose: to determine user opinions and preference for four kinds of braille paper

Project staff: June Morris, Project Codirector  
Debbie Willis, Project Codirector

Background. APH has been using a paper manufactured by Howard Mills for its press braille products. This is an extremely high quality paper that is also extremely expensive. In an effort to identify possible options, a study will be made comparing user acceptance of four braille papers produced by different manufacturers. These are Howard Mills, Scott, Sorg, and Gladfelter.

Work planned for FY 1992. Through its own fund-raising efforts, APH is able to provide The Reader's Digest in braille and recorded on discs to subscribers at no personal cost. In the fall of 1991, the braille edition of the magazine will be changed from a three-volume to a four-volume format. This is in response to user wishes for a size that is less unwieldy. APH will evaluate the experimental papers when the magazine changes to the four-volume format. Approximately 320 names of subscribers receiving the braille edition will be randomly selected from the mailing list to receive the experimental edition in which each of the volumes will be brailled on different papers. To control for the effect of order of presentation, each volume will be prepared in all four paper types and the experimental editions will be collated such that the order of the paper types presented is systematically varied. A questionnaire, pencil, and preaddressed return envelope will be included with the experimental packet.





## Educational Measures



Assessment of Braille Skills (continuing)

Purpose: To develop, or adapt, a test or tests that will assess the braille skills of school age students and adults seeking employment

Project staff: Bill Duckworth, Project Codirector  
Hilda Caton, Project Codirector

Background. APH's Educational Research and Development Committee requested APH develop, or adapt, an instrument that could be used to assess the braille skills of blind students and adults, with particular attention being given to its use for employment purposes.

Work during FY 1991. In FY 1990, preliminary work was done. This included in-house discussion of possibilities, collecting catalogs listing such tests, and contacting various test publishers. Specifications for this test, or tests, were developed. These were a topic for consideration as general test needs were identified (see "New Educational Measures Identification") and at the "Braille Needs Meeting." In FY 1991, due to demands of staff time, little work was done on this project. Contacts were made and project consultants identified. A meeting was held on March 19, 1991, with project consultants to consider the general question of test needs for transition and adults. The primary recommendation of the committee was that project staff visit rehabilitation agencies, including Veterans Administration agencies, to (a) see what kinds of assessment materials are available and being used and (b) to query vocational counselors about the kinds of information they need to place clients in appropriate jobs.

Work planned for FY 1992. Project staff will visit rehabilitation agencies to identify tests in use and the types of additional measures needed to evaluate work related skills in the blind clients they serve.



Brigance Diagnostic Inventory of Early Development (yellow) (continuing)

Purpose: To provide a tactile supplement to this Inventory for blind children ages infancy through 7

Project staff: Bill Duckworth, Project Director  
Josephine Stratton, Research Intern (formerly)

Background. This Inventory is being revised by its publisher. A new edition is expected in 1991. The publisher has said most of the competencies will remain in the same order with much of the material remaining intact.

The adaptation of format has been done on the previous edition. All activities have been assigned a label as to what steps the teacher will take in assessment such as using the supplement, using the print edition with modification, etc. One section, General Knowledge and Comprehension, was completed and evaluated to determine if the format was appropriate. However, a decision was made to put the project on hold until the new edition is released in order that the supplement from APH be for use with the newer edition. The Inventory was approved for production by APH's Publications Committee.

Work during FY 1991. No work was done during the year. However, the new print edition was released in the spring of 1991.

Work planned for FY 1992. A tactile supplement for this inventory will be completed making possible its use with blind children.

Contract Braille and Large Type Tests (continuing)

Purpose: To adapt tests for school systems and states

Project staff: Bill Duckworth, Project Director

Background. Each year APH deals with test developers and states in the adaptation of braille state competency tests and the enlargement of these tests for large type readers. In addition, APH personnel consult with state personnel and voluntary braille transcribers regarding the braille adaptation of their own tests. Whatever services, especially in braille adaptation, local communities or state educational departments need are made available by APH. Some of these include:

1. the complete adaptation of a competency test
2. consultation with adapters who do not know test construction
3. proofreading of braille tests adapted at local or state level

APH feels that these services, or any others a system might need, are very important as many decisions are made on the results of a student taking a competency test. Reviewing volunteer-transcribed tests has emphasized that any test transcribed should include the help of one trained in psychometrics.

For some years, APH has adapted the state tests of Florida, Ohio, and South Carolina by special arrangement through their state departments. Information on the approach used by each of these states is available.

Work planned for FY 1992. Continuation of above.

New Educational Measures Identification (new)

Purpose: To identify widely used academic tests for which braille and/or large type editions are needed

Project staff: Bill Duckworth, Project Director

Background. Since the 1920s, APH has provided academic tests for use by the population it serves. Efforts are made to provide those tests most commonly used throughout the country.

Work during FY 1991. A search has been made of the catalogs containing academic measures as well as those that would be useful to determine various abilities when a student or rehabilitation client is making that transition from school/training to work. The revision of the Boehm was ordered and examined by those involved to determine whether it should be adapted, another test measuring these concepts should replace it, or whether the Brigance materials do a satisfactory job. No determinations of either of the above or other issues have been made. It was decided during this period that two groups (rehabilitation experts and psychologists concerned with the school aged student) convene to examine the instruments found and discuss the issues in determining the direction of test development and adaptation during the next few years. In addition to the above, a survey was conducted of test publishers and through the APH Slate requesting information on well accepted tests and the present needs in the field. Little response was obtained from these last activities. A needs meeting was held on March 18, 1991, during which numerous tests were considered. The measures identified as most needed were the Spache Diagnostic Reading Skills and the new Boehm Test of Basic Concepts--if feasible for young blind children to make the tactual discriminations required.

Work planned for FY 1992. Braille and large type editions of the Spache test will be developed and the feasibility of use of a tactile edition of the Boehm test with young blind children determined.

Microcomputer Applications  
Process and Information Dissemination





Eighth Microcomputer Advisory Committee Meeting (series)

Purpose: To identify and determine priorities for needs for educational materials to support use of microcomputers

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Project Assistant  
Venus Elder, Project Assistant

Background. An advisory group was formed in 1984 to provide specific information and guidance on a continuing basis in the area of technological needs and applications. Seven microcomputer needs meetings were held with the advisory group at APH. They were in August 1984, March 1985, October 1985, September 1986, September 1987, September 1988, and September 1989.

Work during FY 1991. The Eighth Microcomputer Advisory Meeting was held January 27-28, 1991. The committee made the following recommendations:

1. APH PocketBraille. Correct random data loss within this year. Add search-and-replace and cut-and-paste capabilities.
2. LetterTALK+. Complete LetterTALK+.
3. Talking Literacy Kit for Apple II Computers. Complete the Talking Literacy Kit for Apple II Computers.
4. Manuals. Complete the Appleworks Tutorial on cassette and the Appleworks Reference Manual on disk.
5. Enhanced Teacher's Pet. Make Teacher's Pet the foundation for requested drill-and-practice software. Make large print available on screen and as a print option. (Printer of choice is the ImageWriter.) Add CTRL-E commands if they are not already included, and make user-modified pronunciation savable. Data files should be formatted textfiles to facilitate grade 2 translation.
6. Telecommunications. Disseminate information on Kermit availability. Look into adapting a telecommunications simulation program and include this information in the fourth Micro Materials Update telecommunications article. The committee, keeping in mind the workload of the Micro Group, did not give the following a high priority rating, but expressed a great need for a kit which introduces teachers/students/clients to telecommunications. A "cookbook" style manual plus a simulation program is needed. There was discussion of an APH electronic bulletin board, but it was not recommended that APH pursue managing a bulletin board at this time.
7. Typing Program. Write a typing program similar to Talking Typer for the IBM. Consider adding a teaching component to this program which would include information on correct posture and which fingers to use to type particular characters.

8. The committee suggested using Teacher's Pet to develop programs in the areas of high interest, low vocabulary, age appropriate software and early childhood software; and in the area of math drill-and-practice (a priority from the Seventh Microcomputer Advisory Committee Meeting).
9. Resource Guides and Data Disks. Publish resource guides, possibly in a newsletter such as the Micro Materials Update or APH Slate, with information on adapting early childhood software and high interest low vocabulary age appropriate materials.
10. Large Print. The committee recommended that future software from APH include both speech and large print output to the screen. They advised that, if possible, large print output be available to the printer as well. The committee further recommended that APH's Micro Group give consideration to motivational characteristics such as color, graphics, sound, reinforcing statements, etc. when developing or adapting software.
11. Micro Materials Update. The committee recommended that when necessary (e.g., when seeking ideas on adapting early childhood materials and high interest low vocabulary age appropriate materials) the Micro Group should ask for specific information in the Micro Materials Update.
12. Lab Packs. The committee expressed a great need for making APH software available in lab packs. They do not want the consumers to be required to purchase and store multiple binders with hardcopy manuals.

It should be noted that the previous seven microcomputer advisory committees chose to focus on providing computer-related materials for totally blind individuals. This committee was the first to ask APH to begin focusing on aspects of computer-related materials needed by low vision as well as totally blind persons.

13. Hand-held Scientific Calculator. A talking hand-held scientific calculator with a large print display and an earphone jack is desperately needed for students in grades 10 and above. Explore the possibility of providing such a device.

The above recommendations are not listed in order or priority, except for #1 which was given top priority.

The participants of the Eighth Microcomputer Advisory Committee recommended that the following projects be discontinued:

1. World Book Encyclopedia, CD-ROM version
2. Future development Speaqualizer/Speaqualizer MC
3. Spanish-speaking Speaqualizer

Some additional notes of interest resulting from this meeting included:

The committee commended APH for bringing Talking Typer and Textalker-gs to market, and for the articles on telecommunications which have appeared in recent issues of the Micro Materials Update. The participants of the Eighth Microcomputer Advisory Committee meeting recommended that APH provide the Committee members with quarterly updates so that the Committee can follow progress and participate in the rearrangement of priorities as circumstances warrant.

Following the Eighth Microcomputer Advisory Meeting, an in-house meeting was called to discuss the various recommendations of the microcomputer advisory committee. It was determined by the APH Microcomputer Group and Director of the Department of Educational and Technical Research that a talking authoring program would satisfy some of the priorities discussed at the Eighth Microcomputer Advisory Meeting.

The three new priorities:

1. to develop a talking authoring program for use on Apple IIs, Macintoshes, and IBMs,
2. to develop a large print program for the Apple IIGS, and
3. to develop a talking typing program similar to APH's Talking Typer but for use on IBMs and compatibles

were then discussed with the Research and Development Committee at the 1991 Interim Meeting.

The Research and Development committee members at the 1991 Interim Meeting questioned the need for these three types of software programs and recommended:

1. that APH contact members of the Microcomputer Advisory Meeting to get further clarifications, suggestions, comments, criticisms, considerations, and priorities on the three new projects mentioned above,
2. that APH survey the field to determine the need for the three programs in question, and
3. that APH search for programs which already exist that might meet the need for one or more of the three types of programs under investigation.

Work planned for FY 1992. Members of the Eighth Microcomputer Advisory Meeting will be contacted regarding concerns expressed by the Research and Development Committee at the 1991 Interim Meeting. A questionnaire will also be developed regarding the need for (a) an authoring program for Apple IIs, Macintoshes, and IBMs, (b) a large print program for the Apple IIGS, and (c) a talking typing program for IBMs and compatibles. The survey will be sent to appropriate persons. At the same time, a search for programs that already



exist to meet the need for one or more of the three programs in question will be conducted. Responses to the survey will be compiled and results of the data collected will be reported to the Research and Development Committee at APH's 1991 Annual Meeting. On the advice of the Research and Development Committee and in light of the results of the data collected, the needs in this area will be reprioritized.

Two subcommittee meetings are also planned for FY 1992; one on high interest low vocabulary age appropriate software lessons and one on drill-and-practice math programs. (See the write-ups on High Interest Low Vocabulary Age Appropriate Software and Drill and Practice Math Programs for additional information.)

Monitoring Technological Developments (formerly entitled Survey of Products Being Used and Products in Need of Development for Legally Blind Persons Using Microcomputers) (continuing)

Purpose: To determine the greatest unmet needs of the field and set priorities appropriately by gathering information on the current "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually impaired persons

Project staff: Debbie Willis, Project Codirector  
Larry Skutchan, Project Codirector

Background. When APH became interested in developing microcomputer related products in the summer of 1983, it was necessary to determine the greatest needs of the field and set priorities appropriately. Information regarding the "state of the art" of microcomputers, potential applications of technology, and developmental needs in the area of microcomputers for visually impaired persons was gathered during the fall and winter of that year. Recognizing, however, that this is a rapidly changing field, a second survey was conducted in the winter and spring of 1986. These two surveys provided valuable information for planning and decision-making during APH's early involvement in this area.

As the use of computers increased, trends and changes in the computer industry and in education were monitored through literature reviews, attending conferences and exhibits, and talking with a variety of people involved in computer technology. Since these sources of information have become available, it has not been necessary to conduct another major survey. Brief surveys and subcommittee meetings have been conducted as the need arose.

Work during FY 1991. Trends and changes in the computer industry and educational applications of the technology continued to be monitored through literature reviews, perusal of SpecialNet and GENIE bulletin boards' information, talking with vision teachers, computer resource personnel, rehabilitation specialists, software and hardware developers, vendors, blind computer users, and others.

Work planned for FY 1992. Trends, changes, and needs will continue to be monitored as they were in FY 1991. Brief surveys and subcommittee meetings will be proposed as the need arises.

Observation and Information Dissemination (continuing)

Purpose: To gain insight into user problems by observing students at the computer and to disseminate information on current uses of technological aids through workshops, presentations, and other means

Project staff: Microcomputer Group

Background. The Fourth Microcomputer Advisory Committee recommended the microcomputer group help disseminate information about relevant technology to the field. Additionally, the meeting of the interim committee in May 1985 resulted in a strong recommendation that the microcomputer group observe students using APH computer products. To this end, the microcomputer group conducted the summer workshops in June 1986, presented microcomputer materials at several conferences, and observed students on a weekly basis at the Kentucky School for the Blind.

During FY 1990, the microcomputer group along with members of APH's Department of Educational and Advisory Services continued presenting and demonstrating APH microcomputer materials at relevant conferences. Interested students, teachers, and computer users that visited APH also received detailed product information and demonstrations upon request.

In addition, several members of the Microcomputer Group observed students of varying ages using a variety of software. Interested users and potential consumers' questions concerning computer software and hardware products continue to be answered.

Furthermore, an annotated bibliography on technology-related topics from 1980-88 for visually impaired persons was updated to include relevant information from 1986 to early 1990. The bibliography was made available free of charge on 5 1/4" disks formatted for Apple II computers. The bibliography consisted of two AppleWorks files: annotated file (wordprocessor) and initial information file (database).

Student observation, or information gathering, was conducted concerning technological aids and software. These included:

1. The Disabled Citizens Computer Center--special education software, assistive devices, and adaptive firmware card.
2. IBM's TLC (Teaching and Learning with Computers) 2nd-6th grades: reading, language arts, and math
3. IBM's "Get Set" (4 year old prereading program) and "Writing to Read" (K-1 Whole Language Reading program)
4. IBM's PALS program (Principle of Alphabet Literacy System) Adult Literacy

5. IBM presentation of assistive devices, software, and the National Support Center for Persons with Disabilities
6. Assistive Devices and Special Education Software: Kentucky School for the Blind and Churchill Park School
7. Sending for information concerning the following topics: early childhood and microcomputers, math programs, and high interest, low vocabulary materials
8. Street Electronics updated listing of ECHO compatible programs
9. Adhoc Reading Systems demonstration: Kentucky School for the Blind
10. Public school students (second grade) working in computer lab using MECC and Sunburst programs: Price Elementary School
11. A member of the Microcomputer Group offered a course called "Basic Computer Programming" at the Kentucky School for the Blind.

Work during FY 1991. Updating the annotated bibliography on technology-related topics applicable to visually Impaired persons was completed. The updated bibliography includes information from 1980 to early 1991. It was made available free of charge on 3 1/2" disks formatted for Apple II computers. The bibliography continued to be set up as two Appleworks files; a word processed annotated file and an information file on database. Presentations and demonstrations on computer products and services continued to be given during this time period. Responsibility for the latter was shared with the Department of Educational and Advisory Services. Members of that department attended numerous conferences where they exhibited APH's computer-related products. Members of the Department of Educational and Technical Research and the Department of Educational and Advisory Services continued to complete questionnaires from other organizations developing or updating databases on special education hardware, software, peripherals and miscellaneous items, and answered a variety of questions on a daily basis regarding computer products in general, specific computer products, services available, where to find, what's available for, how to do, etc. APH's Micro Materials Update continued to be written and made available to persons included on the mailing list and to those requesting computer-related information.

The Micro Group continued to make an effort to keep up-to-date concerning software programs and assistive devices for visually impaired people. Several of the Micro Group observed students at the Kentucky School for the Blind being introduced to the Nomad, Arkenstone Reader, and Braille Blazer, and observed students using a variety of software. A member of the Micro Group and a member of the Department of Educational and Advisory Services continued to offer classes on computer technology for blind persons. Some members of the Micro Group continued as the editors and writers of the Blind Apple User's Discussion (BAUD). The Micro Group periodically previewed new "talking" software and hardware as it was available.



Work planned for FY 1992. The Microcomputer Group plans to continue attending technology-related conferences, demonstrations, and exhibits of software, hardware, and assistive devices. The group also intends to continue with presentations, demonstrations, and exhibits of APH's computer-related products and the observation of computer users of all ages whenever possible. The Micro Materials Update will be written and made available in the fall and spring. The annotated bibliography on technology-related topics applicable to the visually impaired population will be provided free of charge on 3 1/2" disks to interested persons. Information and answers to a variety of questions regarding computer products in general, specific computer products, services available, where to find, how to do what's available for, etc. will continue to be provided. Members of the Microcomputer Group will serve on committees relevant to the education and rehabilitation of visually impaired persons as needed.

## Product Evaluation (continuing)

Purpose: To evaluate user satisfaction with APH microcomputer products, to monitor and improve project planning and management, and to continue the identification of users of APH microcomputer materials

Project staff: Debbie Willis, Project Director  
Venus Elder, Project Assistant

Background. From the first software product published by APH, all microcomputer materials have included a self-addressed, postage-paid "User Survey Card" which asked for information which would identify the consumer, product, setting in which the product is used, strong and weak points of the product, suggestions for improvement, current equipment accessible to the user, number of users and their age/grade range, and additional comments. As an assessment instrument for evaluation, these cards provide a valuable source of information which aid in the decision-making process of the staff involved with improving existing products, determining future needs and projects, and monitoring trends in these categories. These cards also serve as a vehicle for identifying users of APH microcomputer material which is useful in finding reviewers of products and potential participants in microcomputer advisory meetings.

Results of the entered data were reported at the Fifth Microcomputer Advisory Committee Meeting. The information received through August 1989 was evaluated during the planning stage of the Seventh Microcomputer Advisory Committee Meeting to see if any pattern in requests was occurring. While there was not a great deal of consensus, the most frequently occurring requests were for talking educational games, how people can make their own software talk, switch-activated software, and software for very young blind children.

As a result of these requests, articles on talking Eamon adventure games appropriate for junior high students and above, talking software and single-switch software for a wide range of ability levels including some appropriate for very young and multihandicapped, an article on public domain software libraries with talking software, articles on making your own software talk, and a write-up on APH's Talking Utilities for DOS 3.3 which includes a program to automatically install speech on a disk, were written and included in the 1989 Winter and Summer issues of the Micro Materials Update.

Complete information from all the "User Survey Cards" continued to be entered into a database during the 1990 fiscal year. Needs expressed by users on the "User Survey Cards" were cataloged and placed into various categories. A report highlighting areas which were cited most often was presented at the June 1990 meeting of APH's Educational Research and Development Committee. The top four categories in order of greatest need expressed were: (1) math (early - upper level), (2) educational games, (3) word processing, and (4)

language arts. During the 1990 Kentucky Educational Technology Conference in Louisville, many people who stopped by the APH booth expressed the following need: leisure/enjoyment and/or recreational software for visually impaired and/or multihandicapped elderly persons.

Names and addresses of consumers who returned the "User Survey Cards" were entered into a database to receive free copies of the Micro Materials Update.

Work during FY 1991. "User Survey Cards" continued to be received. The data on the cards were entered into a database of information. A compilation of the data received during 1989 and 1990 was analyzed and written into a brief report for use at the Eighth Microcomputer Advisory Committee Meeting that was held in January 1991. Consumers' suggestions for future software projects, revisions to existing products, and general comments were shared with members of APH's Micro Group and the participants of the Eighth Microcomputer Advisory Committee. The suggestions and comments on the cards were taken into consideration by the staff and committee members in setting new priorities in the area of Technological Needs and Applications.

The participants of the 1991 Braille Needs Meeting identified educational games for use with microcomputers as a high priority need. This information was shared with members of the Eighth Microcomputer Advisory Committee members and will be provided to the members of the Ninth Microcomputer Advisory Committee.

Those consumers who responded to the "User Survey Cards" continued to be entered into the database to receive current and future issues of the Micro Materials Update. Requests for information and difficulties with software that were expressed on the cards were addressed by the Micro Group.

Work planned for FY 1992. The information from the "User Survey Cards" will continue to be entered into a database. The data will be analyzed periodically to study trends, revise current products, assist in future planning, and to identify future software reviewers and potential committee members.

Information Dissemination: Micro Materials Update--newsletter (continuing)

Purpose: To provide a description of completed APH microcomputer materials development projects and other relevant resources for computer products and information to serve as a (a) newsletter for professionals in the field, (b) convenient means of responding to requests for more information, and (c) handout to distribute at appropriate presentations/workshops/exhibits

Project staff: Microcomputer Group

Background. The first Micro Materials Update was generated specifically for the purpose of serving as a handout for a teacher inservice presentation made by APH staff in November 1985. The same year the Microcomputer Advisory Committee recommended adding a column that would include information, in this field, that was being pursued outside of APH. The title of the column became known as "News, Views, and Muse."

Responsibility for the Micro Materials Update was divided between research and marketing staffs. Research was responsible for the content and format of the newsletter, maintaining the database of addresses, and for providing address labels for mailing. The newsletter was made available in braille and print forms. The mailing list continued to grow, giving APH a valuable resource of persons who were buying and using APH software and related products.

The Micro Materials Update was written and disseminated in print and braille twice during FY 1989. Both research and marketing contributed articles. The database of readers continued to be maintained. The Micro Materials Update continued to be provided as a handout at numerous presentations, workshops, and exhibits. For several years, it also served as a quick and valuable response to numerous phone calls and letters regarding APH's computer products.

The Summer 1989 Micro Materials Update and the Winter 1990 issue were written as usual containing articles by both research and customer support staff. The first part of an in-depth series on telecommunications made up the lead story in the Winter 1990 issue; this series was requested by the Seventh Microcomputer Advisory Committee. The pattern of listing all APH computer-related publications and technological products in the Winter issue was continued.

Starting with the Winter 1990 issue, the decision was made to publish the newsletter in large type and cassette instead of large type and braille. This choice will be assessed as responses from readers come in.

Work during FY 1991. After the Winter 1990 issue was published, the Department of Educational and Advisory Services requested that the Micro Materials Update be published in fall and spring instead of winter and summer. The Fall 1990 issue was written, edited, and proofed primarily by members of



the Micro Group in the Department of Educational and Technical Research. As requested by the Seventh Microcomputer Advisory Committee, a second in a series of articles on telecommunications was included in this issue. As requested by the Eight Microcomputer Advisory Committee, a third article in the special series on telecommunications appeared in the Spring 1991 Micro Materials Update. Formatting, artwork, coordinating completion of print and recorded versions, and mailing out were the Department of Educational and Advisory Services' responsibilities. The database of names and addresses of those persons to receive the Micro Materials Update was maintained by the Magazine Circulation and Program Support Department.

Exactly 2,500 print copies and 500 cassette copies were produced of the Fall 1990 and Spring 1991 issues. Approximately 2,000 print and 350 recorded copies were mailed to consumers. The remaining copies were used as handouts at conferences and presentations and as responses to inquiries regarding computer-related products and services.

Work planned for FY 1992. A Fall 1991 and a Spring 1992 issue will be published and made available in print and recorded versions during FY 1992.

Microcomputer Applications

Products



APH PocketBraille (continuing)

Purpose: To develop and refine a portable note-taking device

Project staff: Larry Skutchan, Project Director  
Fred Otto, Project Assistant

Background. The Kentucky Department for the Blind developed the PocketBraille and PortaBraille. Each is a complete portable note-taking system with braille keyboard, parallel and serial ports, and a speech synthesizer. The PortaBraille additionally contains a braille display. Each contains firmware that makes writing and editing possible. With the approval of its Educational Research and Development Committee, APH began designing a version of this system. It is called the APH PocketBraille. The APH PocketBraille was first marketed in June 1988. Since then, one revision was made and released. It corrects some bugs in the original system, improves speech quality and responsiveness, and compensates for differences in a part that is no longer available in the United States.

Work during FY 1991. Progress on the new revision of APH PocketBraille firmware was brisk. A totally new user interface, operating system, and editor were all designed, written, and, for the most part, debugged.

The new software uses a file metaphor to help insulate the user from hardware restrictions by letting him give his work names. Earlier versions required the user to divide his work into memory banks. This was inconvenient because there were only 7 banks, and each bank was a fixed size. In contrast, the new operating system lets the user give his work names that reflect the contents of the file, and each file allocates memory dynamically, so there is virtually no restriction on the size of a file. In addition, the operating system lets the user have 250 files in which to store his work.

The new operating system, along with the capability of creating files, provides the user a variety of file management functions. These include protecting files, setting the status of the reverse translator, deleting files, inserting other files into the currently opened file, and renaming files. These routines were all written this fiscal year. In addition, another file-related feature was written and installed. It lets the user specify the nature of the work in the file. In other words, the user can tell APH PocketBraille that the file is line oriented. That way, when using the previous and next line commands to navigate through the file, APH PocketBraille always brings the cursor to an appropriate resting point. With line orientation turned off, the cursor moves by sentences. This proves quite convenient for proofreading.

Other work on APH PocketBraille includes a totally new writing environment. In previous versions of the firmware, APH PocketBraille's editor was primitive. It was totally line oriented and not very flexible. A completely new editor was written. It gives the advantage of paragraph orientation and an insert mode that is always active. The paragraph



orientation gives the user more power when it comes to inserting large passages or renaming large bodies of text from a document. The insert status lets the user enjoy greater power by providing a more natural and easy way to edit. When the user wants to add text to the middle of a paragraph, the user just moves to the point of interest and types it. The older editor required the user to enter an insert mode, type the text, then exit the insert mode. The older editor also allowed inserting only 255 characters at a time, and there was a noticeable delay while the text was placed into the buffer. The new system shows no delay and has no limitation on the amount of text that is inserted at a time. In fact, as mentioned earlier, the user can actually insert entire files at the cursor.

A new search and replace function was written for the APH PocketBraille's editor. Earlier firmware revisions permitted only finding, but not replacing. The search and replace lets the user replace either automatically throughout a document or individually on a case by base basis.

Other features written and installed in the new editor include deleting to the end of the document, deleting either backward or forward by character, and deleting by words and to the end of a paragraph.

While the operating system and editor represent significant enhancements to APH PocketBraille, the parameter setting method was completely rewritten and a new voice box mode was designed and installed. Earlier revisions of the firmware required the user to know the commands to access parameter settings such as changing baud rate, parity, and data length. Now, when the user presses Chord-P, APH PocketBraille presents a menu showing the settings and the value selected for that setting. The user can select new values by using the previous and next word commands, or select new settings by using the previous and next line commands.

The speech box mode was rewritten. It is now called voice box and it provides some significant features to make APH PocketBraille act as a valuable synthesizer for use with a screen access program on the PC. APH PocketBraille's voice box features a new way of silencing the speech that proves very handy. This new method silences speech to the next phrase which makes scanning through familiar text much more efficient.

Work planned for FY 1992. The APH PocketBraille's new firmware will be tested. Any corrections that require attention will be installed and the manual will be finished.

## Authoring Program (new)

Purpose: To allow the APH Microcomputer Group, teachers, and parents to write specialized talking programs as needed

Project staff: Larry Skutchan, Project Codirector  
Debbie Willis, Project Codirector  
Rob Meredith, Programmer  
Venus Elder, Project Assistant

Background. At the Seventh Microcomputer Advisory Committee Meeting, the participants recommended using an authoring program such as E-Z Pilot II to adapt/develop some math drill-and-practice software. At the Eighth Microcomputer Advisory Committee Meeting, the participants recommended enhancing Teacher's Pet to adapt/develop software in areas that had been identified at the Sixth and/or Seventh Microcomputer Advisory Committee Meetings as high priorities (e.g., early childhood programs, high interest low vocabulary age appropriate software, and math drill-and-practice programs).

Work during FY 1991. E-Z Pilot II was purchased to investigate its usefulness. It was found that when combined with an Echo II speech synthesizer, E-Z Pilot II could be used to create "talking" lessons. The E-Z Pilot II program itself, that must be used to create the talking lessons, does not talk except in review mode when using Textalker-gs. A blind person, therefore, could only create the lessons using speech synthesis when in review mode using an Apple IIGS. Once the lessons were created, a blind individual would have no particular problem using the lessons on an Apple II with speech output. A further limitation of using E-Z Pilot II is that the lessons would be for use on only Apple II computers.

Work planned for FY 1992. The Micro Group will investigate the feasibility of making the E-Z Pilot II program completely speech accessible with TEXTALKER and Textalker-gs. If this is not feasible, or if APH staff along with the current Educational Research and Development Committee determine that a talking authoring program which could be used to create programs for use on Apple IIs, Apple Macintoshes, IBMs and compatibles is feasible and more highly desirable, then APH will begin to investigate development of a talking authoring program. (See the write-up on the Eighth Microcomputer Advisory Meeting for more information regarding the possible development of a talking authoring program.)

The outcome and decisions regarding an authoring program will affect two current priorities:

1. adapting/developing high interest low vocabulary age appropriate programs
2. adapting/developing math drill-and-practice programs

Drill and Practice Math Programs (new)

Purpose: To adapt/develop math programs for practicing/reinforcing skills in addition, subtraction, multiplication, division, decimals, fractions, percentages, grouping, and regrouping

Project staff: Debbie Willis, Project Director  
Venus Elder, Project Assistant

Background. At the Seventh Microcomputer Advisory Meeting, a high priority was given to developing talking and large print drill and practice math programs to include addition, subtraction, multiplication, division, decimals, fractions, percentages, grouping, and regrouping. An authoring program called E-Z Pilot II was purchased to investigate its usefulness for this purpose. With E-Z Pilot II, interactive lessons can be written. When combined with an Echo II Speech Synthesizer, E-Z Pilot II can be used to create "talking" lessons.

Work during FY 1991. At the Eighth Microcomputer Advisory Meeting, the committee again gave high priority to developing drill-and-practice math programs but recommended that an enhanced version of APH's Teacher's Pet be used to develop the math drills.

Some commercial math programs were previewed for concepts covered, order of presentations, and variation in presentation of problems and explanation of solutions. A file of programs and resources was started for future development of this project.

Work planned for FY 1992. A questionnaire will be developed regarding types of math drill-and-practice materials teachers are using (particular curricula, books, or programs and materials they use to reinforce basic math concepts needs. The questionnaires will be sent to appropriate teachers/professionals. A subcommittee meeting, consisting of approximately four appropriate teachers/professionals and APH's Microcomputer Group will be conducted to discuss basic areas/content the software and support materials should follow (goals and objectives) and what software program should be used to write these lessons. The subcommittee will develop specific computer-related activities needed to achieve the goals. An outline or steps the "lessons" should follow will be developed. The "lessons" will begin to be written. Support materials and documentation will be designed and drafted. After an initial in-house review, the "lessons" and drafted support materials/documentation will be sent to the subcommittee members and to selected members of the Microcomputer Advisory Committee for evaluation. The "lessons" and support materials/documentation will be revised utilizing the comments and suggestions of the consultants and Advisory Committee members.

Enhanced Teacher's Pet (new)

Purpose: To develop a simple authoring system so teachers could easily create lessons and so that APH can quickly supply preprogrammed lessons

Project staff: Larry Skutchan, Project Director

Background. The Eighth Microcomputer Advisory Committee recommended that APH develop a simple authoring system so teachers can easily create lessons and so that APH could quickly supply preprogrammed lessons. One possibility was further enhancing Teacher's Pet to provide more flexibility.

Work during FY 1991. The Microcomputer Group has been looking for other authoring systems that might already exist to meet the stated needs.

Work planned for FY 1992. The Microcomputer Group plans to look for a system that generates code that runs on more than one kind of computer.



High Interest Low Vocabulary Age Appropriate Software (new)

Purpose: To adapt/develop high interest low vocabulary age appropriate microcomputer materials for developmentally delayed students junior high and above

Project staff: Debbie Willis, Project Director  
Venus Elder, Project Assistant

Background. The Seventh Microcomputer Advisory Committee gave a high-priority to adapting or developing high interest low vocabulary age appropriate software for developmentally delayed blind students junior high and above. In order to identify and determine priorities for this area, a "High Interest Low Vocabulary (High/Low) Age Appropriate Software Needs Meeting" was held. In preparation for the meeting, an annotated high interest low vocabulary bibliography was compiled.

The target audience identified by the High/Low committee members was: Totally blind, marginally academic students, junior high and above, who are behind in reading and math (for a variety of reasons), and are reading at a fourth-fifth grade level. During the meeting, three major priority areas were identified: (1) daily living skills, (2) study skills, and (3) job-seeking skills. Top priority for daily living skills was given to handling money, money identification, making change, and budgeting. The top priorities determined for study skills were outlining, determining important facts, note-taking, and writing papers. The top priorities for job-seeking skills were career exploration and interest assessment.

The Seventh Microcomputer Advisory Committee recommended: (1) that the Micro Group initially create or adapt a single software selection with support materials in each of the three major areas identified; (2) that the computer-related activities within each of the three major priority areas be related to reading, writing, and math; (3) that the Micro Group plan on software being used as a supplement to class or by an itinerant teacher or in a resource room; (4) that the software be reinforced with braille, large type, and/or audio materials for student use; and (5) that if APH develops these programs from scratch, a programming language be used which allows the software to work on IBMs and compatibles and Apple II computers. If this cannot be done or if programs are being adapted rather than developed, make the daily living skills and study skills software usable on Apple II computers; the job-seeking skills software usable on IBMs and compatibles.

Work during FY 1991. Software titles from a variety of companies including MCE, Job World, and Sunburst were previewed for possible project development. A variety of materials dealing with handling money, money identification, making change, and budgeting were reviewed. Concepts were pulled from software which met the project priorities regarding dealing with money. A listing of support personnel and other resources was compiled and a database was started to keep track of the information.

Work planned for FY 1992. Appropriate people will be identified and surveyed regarding the most common/essential concepts of handling money that the targeted population of legally blind students need to know (particular curricula, books, or programs and materials they use in teaching money matters). A subcommittee consisting of approximately four teachers/professionals and APH's Microcomputer Group will meet to discuss basic areas/content the software and support materials should follow (goals and objectives). The subcommittee will work on specific computer-related activities needed to achieve the goals. Once it has been decided what type of program (i.e., Teacher's Pet or a talking authoring program) will be used to create the "lessons." An outline or steps the "lessons" should follow will be developed. The "lessons" will begin to be written and support materials/documentation will be designed and drafted. The initial "lessons" and drafted support materials/documentation will be sent to the subcommittee members and selected members of the Microcomputer Advisory Committee for evaluation. The "lessons" and accompanying materials will be revised based on the field reviews. The revised materials will then be reviewed in-house and changes will be made as necessary. In its last stage, the total program will be reviewed by appropriate consultants and final modifications will be made as needed to complete the project.

Large Print Program (new)

Purpose: To provide large print output to the screen for use by persons with partial sight

Project staff: Larry Skutchan, Project Codirector  
Debbie Willis, Project Codirector  
Rob Meredith, Programmer  
Venus Elder, Project Assistant

Background. At the first seven Microcomputer Advisory Committee Meetings, the participants chose to focus on providing computer-related materials for totally blind individuals. The committee members felt that a number of commercially available products could be used by partially sighted individuals, but that very little in the line of computer products existed for totally blind persons.

Work during FY 1991. The members of the Eighth Microcomputer Advisory Committee reported that teachers and students need to make use of the same piece of software. As a result, the Eighth Microcomputer Advisory Committee highly recommended that future software from APH include both speech and large print output to the screen. They advised that, if possible, large print output be available to the printer as well. The committee further recommended that APH's Micro Group give consideration to motivational characteristics such as color, graphics, sound, reinforcing statements, etc., when developing or adapting software.

Work planned for FY 1992. APH will initially investigate and possibly begin work on developing a large print boot program for the Apple IIGS. (See write-up on Eighth Microcomputer Advisory Meeting for additional information regarding the possible development of a large print boot program for the Apple IIGS.)

Future software will incorporate improved reinforcing characteristics depending on several important variables including whether the software is being adapted or developed, the particular purpose of the software, time and/or financial allowances for completion of the project, whether expertise to do such is available, particular computer capabilities, etc.

## Manuals (continuing)

Purpose: To provide manuals in braille, large type, recorded, or disk form to support use of commonly used microcomputer equipment and programs

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Fred Otto, Project Assistant

Background. At the Fourth Microcomputer Advisory Committee Meeting, it was recommended that APH continue to provide manuals deemed important in a medium usable by visually impaired persons. In April 1986, Apple offered to supply APH the ASCII text files of Apple manuals for editing and dissemination by APH. The significance of this gesture resides in the fact that an individual possessing the ASCII text file of any work has the ability to output that information in hardcopy regular print, large type, or braille; refreshable braille; or synthetic speech.

Production approval was obtained for the Apple IIGS Owner's Guide and its ASCII text files were received from Apple. Although the idea of a manual reading program did not receive top priority at the Fifth Microcomputer Advisory Committee Meeting, it was decided that a beginning level program for ease of reading text on disks would be written.

During FY 1989, the text files of the Apple IIGS Owner's Guide were broken down by topics into small files and grouped in subdirectories for easy access by the manual reading program. The disk also contains the complete manual in one large file for those who wish to print it out in its entirety and an introduction in braille and large type. The edited version of the disk edition, with additional changes specified by Apple's editors, was approved by Apple.

After lengthy consideration of the implications of allowing manuals on disk to be provided, Apple's Legal Department formalized its Software Licensing Agreement for disk manuals and granted APH permission to publish Apple manuals on disk, in addition specifying that APH will have first choice of which of Apple's manuals to publish on disk.

Apple sent text files of the Apple IIc+ Owner's Guide with permission to produce it on disks as well. APH received permission from Addison-Wesley to produce Applesoft BASIC Programmer's Reference, BASIC Programming with ProDOS, and the Apple IIe Technical Reference on disk. APH personnel also met with an IBM representative to discuss the need for disk versions of IBM manuals. It appears that IBM is interested in working in that direction. IBM manuals can currently be accessed through an on-line communications system called "Book Manager." The user, however, pays a fee comparable to the cost of the printed manual plus the on-line cost.

In FY 1990, the disk version of the Apple IIGS Owner's Guide was made available.



After protracted correspondence with Claris Corporation, APH received permission to publish the Appleworks Reference Manual and AppleWorks Tutorial on disk. Project staff had to devise language for the license agreement which would satisfy Claris' concern over use of the disks by people who are not visually impaired. These two books were given priority over the Apple IIc+ Owner's Guide and the Apple IIe Technical Reference, for which APH has the disks but which have lost some of their initial appeal as projects.

Work during FY 1991. Upon consideration of the presentation of the content in the AppleWorks Tutorial, it was decided that a disk-based version that would be read primarily through a speech synthesizer would not be useful, since the reader would have to stop the manual-reading program and start AppleWorks each time a new series of steps was called for in the Tutorial. Permission was received from Claris Corporation to produce a tape recorded version of the AppleWorks Tutorial, which would allow the reader to move easily between the text and the program. Preparation of the text for recording in the APH studios is complete.

The AppleWorks Reference Manual, which will be produced on disk, has been completely adapted.

Work planned for FY 1992. The AppleWorks Reference Manual will undergo in-house reviews and, after final changes have been made, it will be turned over to production. The two AppleWorks manuals will be produced and sold as a package. Production of more manuals on disk or recording will be weighed against other priorities, timeliness of the materials, sales, and responses to the first products.

MECC Software (continuing)

Purpose: To adapt widely used educational software distributed by the Minnesota Educational Computing Corporation (MECC)

Project staff: Debbie Willis, Project Director  
Larry Skutchan, Systems Programmer  
Venus Elder, Project Assistant

Background. Participants in the Second, Third, Fourth, Fifth, and Sixth Microcomputer Advisory Committee Meetings and members of the Educational Research and Development Committee at APH's 1986 Interim Meeting and 1988 Annual Meeting assigned high-priority status to the development of speech-adapted software from MECC. This challenge was particularly noteworthy because MECC materials are developed by educators and include a vast collection of titles already available to thousands of school systems nationwide.

General approval for production of speech accessible adaptations of the MECC software was granted with the following priorities: 1. mathematics, 2. science and simple logic, and 3. English, social studies, and writing.

After completing the talking version of Elementary Volume 1--Mathematics, permission was sought and received from MECC to modify three additional selections. They were Food Facts, Elementary Volume 5--Language Arts (Prefixes), and Social Studies Volume 1.

During FY 1989, final modifications were made to the talking version of Food Facts. The supplement, to accompany the talking disk and original MECC manual, was completed. After consultants evaluated Food Facts, and a final in-house review was conducted, the modified version was submitted to MECC for final approval and then turned over to production. This program became available during FY 1989.

Elementary Volume 5--Language Arts (Prefixes) was completely reworked in order to operate more quickly, to keep student records, and to set up each file so that the teacher will be able to alter the files in any way desired. The puzzles on the disk were also improved and the question/answer choices were randomized to provide greater use of the program for each student. The program was reviewed several times in-house and by outside consultants. Many "bugs" in the program needed to be worked out before it operated appropriately

The supplement, to accompany the original MECC manual and the talking version of Prefixes which includes talking versions of the original Prefixes print worksheets, was rewritten for the revised program. The word lists used in the Prefixes program were included in the supplement to be provided in large type and braille so that the blind students' activities would not be made more difficult by becoming a spelling problem in addition to the task presented. The supplement discussing the changes and new operational features of the program was reviewed and edited.

The final draft of Elementary Volume 5--Language Arts (Prefixes) was sent out for evaluation.

Following an in-house review of Social Studies Volume 1, it was decided that the program would not be useful to teachers unless background information for using each program on the disk was provided. A social studies teacher who worked on the original MECC version was contacted regarding writing the necessary background information for each unit and the student worksheets necessary to the unit. Mr. Loren Dunham provided suggestions for improving the current documentation by including an enhanced "Instructional Design Model." Mr. Dunham developed the necessary background information for one of the programs, USPOP, on the Social Studies Volume 1 disk as a prototype.

MECC was contacted regarding obtaining permission to adapt three more programs, Writing A Narrative, Oregon Trail, and Word Munchers. Permission to adapt these programs was never granted.

During FY 1990, field reviews of Elementary Volume 5--Language Arts (Prefixes) were received. Numerous suggested changes were made by the consultants. Programming changes were made as recommended by both in-house and field reviewers. Some of the program's activities were reworked to simplify the language used and to reflect more modern age-appropriate questions. Instructions were altered to give precise information. The program was enhanced with a tone-playing algorithm and small musical selections were added to the tutorials associated with each of the lessons. To add appeal for the low vision users, simple pictures were created to show while making the transition from tutorials to the lesson program. An "Extensions Manual" which provides pre- and post-computer integration activities to supplement the talking version of Prefixes was written.

An in-house review of Prefixes indicated continued difficulties with the crossword puzzles and numerous small problems. The crossword puzzles were reworked for ease of use and speed in constructing the puzzles.

The background information on USPOP was received and reviewed by in-house staff. It was found to be quite excellent and more extensive than actually planned. Providing this same type of needed background material to accompany the ELECT series and POLICY program on the Social Studies Volume 1 disk was discussed and negotiated with Mr. Dunham. He agreed to provide the necessary materials to accompany the talking programs and original MECC manual.

The Seventh Microcomputer Advisory Committee recommended that APH discontinue all work on MECC programs. The committee felt that modifications of these programs did not meet relevant educational needs of blind students. APH staff decided that except for completing Prefixes and Social Studies Volume 1, no additional MECC programs will be modified unless specific selections are found that meet precisely defined educational needs of blind learners.

Work during FY 1991. As a result of in-house reviews, a final list of changes needed on the Prefixes program was developed and turned over for reprogramming and debugging the software. Drafts of the supplement and extension activities were completed and reviewed, but the documentation cannot be finalized until the software is in a near finished form.

The teacher who had worked as a consultant preparing the background material for the programs on the Social Studies Volume 1 disk was unable to continue due to other professional and personal responsibilities.

Work planned for FY 1992. Due to work on other higher priority projects, the final programming changes and debugging on the Prefixes software have not been done. These will be completed during this fiscal year. Once the software is in its final form, the documentation will be revised and completed. The program will be turned over for production during this fiscal year.

The partially modified Social Studies Volume 1 program will be reviewed and a decision will be made whether to drop the program or use what's been done so far and make the program available as is.



SEI Software (completed)

Purpose: To adapt educationally sound, commercially available software for use by visually impaired persons

Project staff: Debbie Willis, Project Director  
Rob Meredith, Programmer  
Larry Skutchan, Project Assistant  
Venus Elder, Project Assistant

Background. At the Second Microcomputer Advisory Committee Meeting, a modified version of Sliwa Enterprises, Inc. (SEI) educational software series was given high priority. The content of each SEI program is appropriate for high school and college students as well as adults. APH was able to make an arrangement with SEI for a customized edition of 33 of these programs. SEI, however, retained manufacturing rights to these programs. Production approval for the series was received.

Before going to production, each disk was thoroughly checked for any factual or grammatical type errors; a camera-ready introductory page, title page, and reference guides were prepared to accompany the large type manual for each program. The same materials were also prepared for braille. SEI complied with APH request that an updated version of TEXTALKER be used on its disks to make the programs compatible with the Apple IIGS. Prior to FY 1989, 20 programs were turned over to production.

During FY 1989, adaptation was completed on the remaining 13 programs and they were submitted for production. Project staff worked with production personnel as needed on manufacturing the programs. All 33 APH/SEI talking software programs became available from APH during this fiscal year. Sales of the programs were monitored.

In order to better serve APH's customers by determining its own production schedule, APH negotiated manufacturing rights during FY 1990 for the 33 APH/SEI talking software programs modified especially for APH. Manufacturing rights and the 33 masters were received. The masters were spot-checked; several "bugs" were found and corrected. Duplicates for the Department of Educational and Technical Research, for production, and for Steve Sliwa were made. The masters were then stored for safe keeping.

Work during FY 1991. Sales of APH/SEI Talking Software have been good. The Micro Group has received a considerable number of comments and suggestions regarding the three programs (i.e., Vocabulary Builder, Word Analogy, and Sentence Completion) that make up the SAT series. The primary suggestions are that the speech on these be corrected and that pauses in the speech output be incorporated in appropriate places. These suggestions were discussed at the Eighth Microcomputer Advisory Committee Meeting. Because of other higher priorities, changes to these programs were given a low priority by the committee members.

In order to make the 33 APH/SEI talking software program work appropriately with the new Echo II speech synthesizer when used with an Apple IIIGS in the fast mode, some reprogramming needed to be done during this fiscal year. The programs were then checked for problems that resulted from the programming modifications. New masters for the Department of Educational and Technical Research and the Production Department were made. While the programs were being revised, the manual was also being rewritten so that a generic manual could be produced. Once the current stock of SEI manuals is depleted, the new generic manual will be offered separately from the SEI talking software programs.

Work planned for FY 1992. Sales of the programs and suggestions for changes to the programs will continue to be monitored to determine the need for any further activity.

Speaqualizer (completed)

Purpose: To produce a speech synthesis system for IBMs

Project staff: Larry Skutchan, Systems Programmer  
Jim Robinson, Manufacturing Specialist

Background. The Speaqualizer is a hardware based access package for the IBM computer. It permits the blind user to use speech to examine text displayed on the screen.

Speaqualizer was developed by the Research Committee of the National Federation of the Blind. After obtaining production approval from the Educational Research and Development Committee, APH research staff members began working with the National Federation of the Blind to continue development of the device's firmware. It became available from APH in July 1987. Since then, several enhancements have been introduced and offered to existing users as upgrade packages that provide the new features to existing Speaqualizers. These include features like the ability to completely silence the speech for use by sighted coworkers, improved cursor handling performance, and improvements with respect to use in word processing applications. In addition, the DIP switches on the board were used to provide configuration information and preferred startup parameters. The boards were also modified to work on the new, faster machines becoming available.

Work during FY 1991. Much preparation for the new Speaqualizer design was completed. This includes rewriting the code to make it easy to switch to the new display mapping and hardware I/O location recognition. (Recall that the new design permits Speaqualizer to capture the entire screen RAM of the host computer.)

Extensive evaluation was conducted into the feasibility of moving the environment from its Z-80 microprocessor design to the 8088 family of processors. This change would permit the programming team to use a variety of tools that are much more rich in the 8088 environment while allowing the system to evolve with that family of processors. Considerations along these lines were made early in Speaqualizer's development and enhancement phases, but, at that time, it was considered too much of a burden to convert the existing code to the target processor format. It has been determined that this work can be done in a matter of weeks and that the future benefits would be well worth the effort both in terms of compatibility, growth, and maintainability. Additionally, the new processor would help reduce the size and cost of the system if the DoubleTalk speech system is chosen.

Work on the speech component of Speaqualizer progressed, although not as quickly as expected. Tim Cramner made contact with Digital Equipment Corporation, the manufacturers of the Dec-Talk speech synthesizer, who had expressed an interest in working with a nonprofit organization. The negotiations, however, did not look too promising. If work with Digital Equipment Corporation fails, the original plan of using the DoubleTalk speech system will resume.

Work planned for FY 1992. The National Federation of the Blind estimates that it will have more resources to put into research and will take over much of the future development on Speaqualizer.



Talking Literacy Kit (TALK): Apple II Computers (continuing)

Purpose: To provide an introductory set of speech-accessible computer software and related materials for any of the current Apple II family of computers which could be easily integrated into existing programs of computer literacy or introduction to computers for legally blind youth through adult beginners

Project staff: Debbie Willis, Project Director  
Rob Meredith, Programmer  
Fred Otto, Project Assistant  
Venus Elder, Project Assistant

Background. During the fall and winter of 1985, the Talking Apple Literacy Kit (TALK): //e Edition was in the production pipeline of APH. The product became available in September 1986. First run sales were most encouraging. Subsequent runs of the kit were initiated and sales remained brisk. In response to requests from the field, APH offered sets of the Brailled Keyboard model for the Apple //e, a component of the TALK, as a separate item. The name of the kit and other components were changed in 1987 in order to be in compliance with the legal guidelines of Apple Computer, Inc.

At the Fifth Microcomputer Advisory Committee Meeting, a revision of the kit to include all current Apple II computers received high priority. Work on two components of the revised kit, the Brailled Keyboard Overlay for the Apple II GS(R), and the disk introducing the keyboard, word processing, and games was started.

Work on the disk was continued during FY 1989. The introductory word processing program, introductory games, and keyboard practice were programmed for speech and large print output to the screen. The program was named LetterTALK+. Documentation to accompany the disk was drafted. The program was reviewed in-house several times and underwent many changes.

Work on the Brailled Keyboard Overlay for the Apple II GS also continued. Prototypes of the overlay were developed, checked for accuracy, tested for legibility, and a brief supplement to accompany the product was written. After some revisions, the materials were completed and turned over to production. It was decided to offer LetterTALK+ and the Braille Keyboard Overlay for the Apple II GS as separate products from the kit. The overlays were produced and are being sold separately from the kit in packages of five.

During FY 1990, the draft of the documentation for LetterTALK+ was expanded to include "Extension Activities." Review of LetterTALK+ by in-house staff indicated problems related to the speed settings for the operation of the programs on the disk and several other major operational changes were needed. LetterTALK+ was used at the Kentucky School for the Blind during its summer enrichment program. Several problems were discovered as a result of the students' use of the program. An extensive list of changes was sent to the programmer.

The software disk entitled APH Presents the Talking Apple was reprogrammed to convert the modules over to ProDOS, to reorganize the source code for current editors in use, and to make the program recognize the wider variety of Apple II computers currently available. This program was updated to include features of the Apple IIGS, new features of TEXTALKER, and suggestions from the field.

Sections of the teacher's manual were updated and rewritten to include current information.

Work during FY 1991. After in-house review of LetterTALK+, an extensive list of changes was sent to the programmer early in the fiscal year. Due to personal time constraints, the programmer was unable to work on the necessary changes. A draft of the documentation to accompany LetterTALK+ was written, but cannot be finalized until the software is in its final stages of completion.

APH Presents the Talking Apple underwent programming changes to make it compatible for use with the Slotbuster and DoubleTALK. After these and several operational programming changes, APH Presents the Talking Apple received several in-house reviews. A draft of the updated and expanded teacher's manual was written; the final form it takes will depend on the final versions of the software and comments from reviewers.

Work planned for FY 1992. Because the original programmer of LetterTALK+ has been unable to work on the necessary revisions, another programmer will take over the task in FY 1992. After LetterTALK+ has been corrected and revised, it will again be reviewed by in-house staff. Final necessary changes will be made to the program disk. The documentation accompanying LetterTALK+ will be revised, edited, and a final draft prepared. Reference sheets to accompany the disk will be prepared. The final draft of the LetterTALK+ software program with accompanying documentation and reference sheets will be evaluated by outside consultants. After suggested modifications have been made, LetterTALK+ will have a final in-house review and then be prepared for production as a separate software program, independent of the Talking Literacy Kit.

APH Presents the Talking Apple will be reworked in light of the criticisms and suggestions made by the in-house reviewers during FY 1991. Once it has been reprogrammed, in-house reviews will again be done. Final changes to the software will be made and a final review will be done before including APH Presents the Talking Apple in the revised Talking Literacy Kit.

The remaining sections of the teacher's manual will be updated. The revised manual will then be recorded. The computer parts collection in the kit will also be reviewed and updated.

The entire revised kit will be evaluated by two consultants. After final revisions and a final in-house review, the Talking Literacy Kit for Apple II Computers will be turned over to production.

Talking Typer (completed)

Purpose: To provide students/clients and teachers with appropriate software and documentation for use in reinforcing typing skills with computers

Project staff: Debbie Willis, Project Codirector  
Larry Skutchan, Project Codirector  
Rob Meredith, Programmer  
Fred Otto, Project Assistant

Background. At the Second Microcomputer Advisory Committee Meeting, a typing program called Kids Can! Typer, developed by Ted Hasselbring and Carol Hamlett for sighted special education students, was demonstrated and discussed. The advisory group gave a speech-adapted version of this program a high priority. APH acquired complete marketing rights to the speech-adapted version and contracted with Carol Hamlett to make the necessary programming changes. Production approval was requested and received for this product.

An initial version of the adapted program (teacher disk, student disk, and documentation) was completed. The three components were thoroughly reviewed by in-house staff and several major "bugs" were found. A review of the entire program with suggestions for changes was sent to Carol Hamlett. While initial plans had not included adding speech to the teacher disk, Miss Hamlett reprogrammed that disk to make all the essential information being presented to the screen talk. A revised version was sent to APH. A preliminary review indicated there were still too many problems in the program's operation to send it out for formal evaluation and the manual was difficult to follow. Therefore, more revisions were required.

During FY 1989, all known bugs were eliminated, several speech oriented enhancements (including complete speech support for the editor) were installed, and the documentation was revised. After numerous in-house reviews and changes, a final draft of the entire Talking Typer program was sent out for evaluation by consultants.

After being reviewed by outside consultants and undergoing repeated in-house examinations, the Talking Typer underwent numerous small changes during FY 1990. Some of these were in the nature of bug fixes, but most were aesthetic changes to enhance the usefulness and logic of the program. The manual was edited, revised for accuracy and thoroughness, and reorganized for understanding and ease of use. Camera-ready copy of the manual was prepared for production.

Informal meetings were held to discuss final packaging of the disks, the number of disks to include in 5 1/4" and 3.1/2" formats, and instructions for use and rights regarding copying of the disks. There was also discussion of the best features and settings to include as defaults with the program as shipped. Because of the complexity of placing innumerable options under control of the instructor via the Teacher's Disk, the total program was given repeated serious in-house reviews.

After all aspects of the Teacher's Disk, Student's Disk, and documentation were coordinated, accurate, and working appropriately, Talking Typer was prepared for production. APH staff decided that the program would be made available as Teacher's versions in 5 1/4" and 3 1/2" formats as well as supplemental Student disks in the same disk formats. The documentation included in the Teacher's versions would be provided in large type, on disk, and on cassette.

Work during FY 1991. The Educational and Technical Research staff worked with the Production Department in manufacturing the first run of Talking Typer. This program was produced in 3 1/2" and 5 1/4" versions, Student's and Teacher's Editions. It was priced and shipping began early in 1991. Sales have been excellent, particularly of the 5 1/4" versions.

Work planned for FY 1992. Talking Typer is complete. Changes to future versions will be dictated by responses from customers.



Telecommunications (continuing)

Purpose: To introduce blind students, clients, and teachers to telecommunications; what it is, its wide array of uses, how to communicate via modem with other computers, how to access national services and bulletin boards

Project staff: Microcomputer Group

Background. At the Fifth and Sixth Microcomputer Advisory Committee Meetings the need for materials to introduce students and teachers to telecommunications was expressed. "Networking," "telecommunications," and "distance learning" had quickly become projects of great importance in the schools.

The Microcomputer Group found bulletin board simulations and tutorials on the subject. In addition, the group observed classes on the subject.

Research in the area indicated that speech output for existing telecommunication training materials would meet the needs of blind students. Therefore, with the approval of the Seventh Microcomputer Advisory Committee, it was decided that the best approach to this topic would be a series of articles in the Micro Materials Update. The first of the series appeared in the Winter 1990 issue.

Work during FY 1991. The second and third in a series of articles regarding telecommunications was written and published in the Fall 1990 and Spring 1991 Micro Materials Update.

The Eighth Microcomputer Advisory Committee recommended that the Micro Group disseminate information on Kermit availability. The committee further requested that the Micro Group look into adapting a telecommunications simulation program and include this information in a future Micro Materials Update telecommunications article.

Work planned for FY 1992. The recommendations of the Eighth Microcomputer Advisory Committee will be investigated and reported. This and additional information on telecommunications will continue to be disseminated through the Micro Materials Update as long as there is a need for such.

TEXTALKER (completed)

Purpose: To incorporate features specifically recommended by blind users into the TEXTALKER software and to set standards for use of speech synthesis on the Apple II

Project Staff: Larry Skutchan, Systems Programmer  
Rob Meredith, Programmer

Background. TEXTALKER is the software that works with the Echo synthesizers to provide the Apple with synthesized speech. It was written by Street Electronics Corporation. Members at the Third Microcomputer Advisory Committee Meeting recommended the program be modified to more accurately reflect the needs of the blind user and to help set standards for talking software. The research staff gathered information from several sources including a survey conducted by Bob Glass, the suggestion files at Street Electronics, comments from end users, and observations of users in the field. With the cooperation of Street Electronics, several improvements were added to the system that both enhanced productivity and increased ease of use. One of these features, the ability to silence any text with any keystroke, has become a standard not only on the Apple, but in many IBM screen access packages. (APH's Speaqualizer supports this feature.) APH's initial version of TEXTALKER was released as version 3.1.1. Later, with the introduction of the Apple II GS, TEXTALKER received changes that permitted it to function at the new computer's higher processing speeds. This and enhancements that enabled the user to define columns for reviewing purposes were installed and the program was released as version 3.1.2.

Work during FY 1991. Several significant changes were made to both versions of TEXTALKER. Many of these were prompted by the change in speech synthesizer chips when Texas Instrument Company dropped the 5220. Routines were written to determine the speech chip used in any member of the Echo family and adjust the timing accordingly.

Several minor problems were corrected and several parts of the code were optimized. Some new features and commands were also added to Textalker-gs. One new feature added to Textalker-gs lets the user be notified of words that contain capital letters interactively. Previously, to identify capitalized words, it was necessary to go into review and examine the word in question on a character-by-character basis. Another was the addition of two undocumented commands to let the technical team provide field support for specialized situations where a machine runs at faster speeds than the programming team has tested.

Typing Program (new)

Purpose: To provide students/clients and teachers with appropriate software and documentation for use in teaching/reinforcing typing skills using IBM and compatible computers with speech output capabilities

Project staff: Larry Skutchan, Project Codirector  
Debbie Willis, Project Codirector  
Rob Meredith, Programmer  
Venus Elder, Project Assistant  
Fred Otto, Project Assistant

Background. As recommended by several Microcomputer Advisory Committees, the nontalking Kids Can! Typer was adapted by the Micro Group for complete speech accessibility. The talking version, Talking Typer, for use on Apple II computers became available from APH in January 1991.

Work during FY 1991. The members of the Eighth Microcomputer Advisory Committee gave a high priority to developing a typing program similar to Talking Typer for use on IBM and compatible computers. They recommended that an additional teaching component with information on correct posture and fingers to use to type particular characters be included.

Work planned for FY 1992. The Micro Group will begin investigating commercial programs and alternative solutions to the above need. (See write-up on Eighth Microcomputer Advisory Meeting for additional information regarding the possible development of a talking typing program for use with IBM and compatible computers.)

The World Book Encyclopedia, Disk or CD-ROM Edition (discontinued)

Purpose: To provide a special edition of The World Book Encyclopedia which would be accessed via technology

Project staff: Larry Skutchan, Project Director

Background. APH has produced two special editions of The World Book Encyclopedia. The first was a braille edition of the 1959 reference work and the second was a recorded edition based on the 1978 and 1979 editions. Updated information was provided for the latter through provision of three supplements; The World Book Year Books for 1980 and 1981, 1982 and 1983, and 1984 and 1985. Due to the age of the main reference work, a decision was made not to produce any subsequent combined yearbooks. However, visually impaired students need access to a major reference work such as this encyclopedia, which is the most widely used encyclopedia for educational purposes.

APH met with World Book personnel and learned that World Book was still interested in working with APH and that the text was available in electronic form.

Investigation continued into the feasibility of developing retrieval software to run on the Apple II line of computers. It was determined that APH could produce retrieval software that runs on the Apple II GS with relatively little difficulty that could actually use the text as it already exists on the IBM format disk. In addition, APH can reformat the text into a CD ROM in the Apple ProDOS format that could be used by all Apple II computers with at least 128K of RAM.

Work during FY 1991. Since the inception of this project, World Book, Inc. has released a CD-ROM version of World Book encyclopedia. This means that it is not necessary for APH to pursue this project any further.

Work planned for FY 1992. Since the Eighth Microcomputer Advisory Committee recommended that this project be dropped, no further work is planned.





Other Activities



Analysis of the 1990 Registration Data (completed)

Purpose: To describe the legally blind population registered through APH

Project staff: Karen Poppe, Project Director

Background. Each year information concerning legally blind students in the nation is reported to the American Printing House for the Blind in order to register eligible students for federal quota funds. Periodically, these data are examined to discern trends within the population and general characteristics of students requiring materials and services. The most recent of these analyses is reported in Distribution of Quota Registrants in 1987: Grade Placement, Visual Acuity, Reading Medium, School of Agency Type, and Age that was prepared by Suzette Wright.

Work during FY 1991. During the latter part of 1987, a lengthy program was developed for the new computer system installed for management of the annual registration. This same menu-driven program was used to generate the needed information for the analysis of the 1990 registration data. Provided were the numbers of students reported in each school/agency type (4 categories), grade placement (20 categories), reading medium category (5 categories), and visual acuity category (9 categories); the average age of students was also calculated. The computer program provided, in tabular form, the combined analyses of these variables, thus showing the distribution of students by one, two, or three defining factors. A total of 19 tables were generated based upon the 1990 registration data. Some data were modified for the purpose of the analysis; omission of a student from the total population was warranted if (a), the student was reported by the Hadley School for the Blind; (b) if a student was reported with a visual acuity in category X (field restriction) in one or both eyes or (c) if a student with a "better eye" category of VIII (light projection or perception) or IX (totally blind) was reported using a visual reading medium. A total of 2,328 students were deleted from the original population of legally blind students; consequently, the analysis of the 1990 registration data was based upon 45,743 students--95.2% of the total number registered. Additional attention was given to comparing the information examined in this study to the 1987 registration data; such an inter-study comparison was not possible in 1987 due to many irregularities found in how data were reported to APH during that year and the previous years. Categories of information requested are now more clearly defined and mutually exclusive.

A formal and detailed report describing the demographics of the current population of legally blind students and developing trends was prepared and completed in March 1991. This analysis of the 1990 registration is available upon request from the Department of Educational and Technical Research.



Hand-held Scientific Calculator (new)

Purpose: To provide a talking hand-held scientific calculator with a large print display for use by legally blind high school students and adults

Project staff: to be determined

Background. At the Seventh Microcomputer Advisory Committee Meeting, the participants gave a high priority to the adaptation/development of a talking hand-held scientific calculator.

Work during FY 1991. At the Eighth Microcomputer Advisory Committee Meeting, the participants reported that a talking hand-held scientific calculator with a large print display and an earphone jack is desperately needed for students in grades 10 and above.

Work planned for FY 1992. APH will explore the possibility of providing a talking hand-held scientific calculator that has a large print display.

Surveys of Ex Officio Trustees (series)

Purposes: To obtain information for APH (a) regarding needs for materials and (b) for administrative purposes

Project staff: June Morris, Project Director  
Karen Poppe, Project Assistant

Background. Periodically, ex officio trustees have been queried about timely topics (e.g., specific textbook needs, specific needs for special teaching materials, preferred days for Annual Meetings, resources for purchasing educational materials, information on minimum competency testing in their states/agencies, etc.).

Work during FY 1991. No surveys were undertaken during this period.

Work planned for FY 1992. It is probable that a survey will be conducted in the spring of 1992 similar to those conducted in the springs of 1989 and 1990 regarding APH's products and services.

Tools for Selecting Appropriate Learning Media (new)

Purpose: To expand the assessment section (Section II) of the document entitled Print and Braille Literacy: Selecting Appropriate Learning Media which was developed at the American Printing House for the Blind by a group of experts in the areas of print and braille literacy

Project staff: Hilda Caton, Project Director  
Eleanor Pester, Project Codirector

Background. On June 8-9, 1990, a committee of experts in the field of education of visually impaired children met at APH to develop a set of guidelines to assist teachers of visually impaired students in selecting the appropriate learning media/medium for their students. The resulting document is entitled Print and Braille Literacy: Selecting Appropriate Learning Media and is published by APH. This document does not contain specific, detailed assessment procedures. Instead, it contains general guidelines to assist teachers and other professionals in making decisions about learning media. Members of the committee who developed the guidelines felt that it was necessary to expand them and to develop specific assessment procedures for determining the appropriate learning media/medium for individual students. In order to accomplish this, a planning committee was formed to draw up specifications for this project.

Work during FY 1992. This committee met at APH on August 26-27, 1991, to address such questions as: (1) what information is needed in order to make valid decisions about students' learning media/medium. (b) what is already available to assist in this process, (c) what is not available, and (d) what assessment instruments (if any) are needed to develop or adapt for this purpose. This is not an exhaustive list of questions addressed, but it reflects the general purpose of the project. The meeting resulted in the outlining of an expanded version of Section II of Print and Braille Literacy which will include specific assessment procedures and instruments for each part of that section. Members of the planning committee will assist in the writing of these sections and additional members will be added to the committee as needed. The writing of the first draft of these sections will be completed in November, 1991. These drafts will be edited and revised and a first draft of the complete document completed by May 31, 1992. This will be sent to the committee for review in June 1992. Committee members are:

Sr. Margaret Fleming, Teacher, St. Lucy's Day School, Philadelphia, Pennsylvania  
Mrs. Ruth Holmes, Retired Low Vision Specialist, Illinois School for the Visually Impaired and the State of Illinois, Jacksonville, Illinois  
Mr. Fred Schroeder, Director, New Mexico Commission for the Blind, Santa Fe, New Mexico  
Dr. Susan Spungin, Associate Executive Director, American Foundation for the Blind, New York, New York  
Dr. Robert Winn, President, The Hadley School for the Blind, Winnetka, Illinois  
Dr. Diane Wormsley, Director of the Western Regional Center, American Foundation for the Blind, San Francisco, California

Technical Research Division





Technical Research Division

Purpose: To develop products involving technology and to introduce other new products for production

Division staff: Bob Phelps, Manager  
James Robinson, Manufacturing Specialist  
Frank Hayden, Manufacturing Specialist  
Darlene Donhoff, Technical/Clerical Assistant

Background. For many years APH personnel from its research and new products departments worked closely together in the development of electronic and other technological products and in the process of transforming experimental prototypes of new products into manufactured goods. Because of this close relationship, in January 1989 an organizational change was made in which the New Products Department became the Technical Research Division of the Department of Educational and Technical Research (previously the Department of Educational Research).

Work during FY 1991. Every new product initiated by Educational Research staff or by other areas of APH requires a bill of materials be estimated, vendors be located, raw materials be priced, raw materials numbers be constructed, work orders be assigned, lead times for manufacturing be calculated, and other associated production tasks be done. Some require artwork for new tooling processes. When revisions are made, old stock is pulled and replaced with new. These constitute the daily nuts and bolts of the Technical Research Division operations; in addition, the following briefly describes specific projects addressed by this division:

AC/DC Rechargeable 4-Track Cassette Tape Recorder/Player--Redesign. A prototype mock-up sample was received from Thompson Consumer Electronics for evaluation purposes. It was thoroughly examined by everyone concerned and all problems and/or suggestions documented and given to Thompson. In late June a sample off the actual production line was received. A few minor problems were identified and reviewed with Carl Friedline of Thompson Consumer Electronics who indicated all problems would be corrected.

APH Multiple Headset Adaptor. This product was redesigned to use a mini jack and plug, now in common use, instead of the 1/4-inch jack and plug previously used. This change necessitated the redesign of the case. The updated product was completed and stocked in February 1991.

APH PocketBraille. A repair manual for this product was under development during the year. Initially, repairs of products involving technology are the responsibility of the Division, which is also responsible for writing repair manuals. Information obtained actually making repairs is incorporated in the manuals. At the time a manual is completed, it is turned over to APH's Electronic Repair Department which assumes responsibility for repairing the product at the time.

APH Portable Plus. The Division implements the first production run of most of APH's new educational aids and tools. The initial run of 200 units of this device was completed. Related tasks included completing work orders (paperwork), making revisions to the production manual which is used in subsequent production runs, modifying over 300 of 500 circuit boards used with this product, repairing units returned for malfunction, and developing a repair manual.

Bright Sights Kit(s). A problem with the paint chipping off the painted wooden blocks in this kit was corrected. Working with Glen Spencer, of Spencer Machine and Tool Company, and Tom Poppe, the blocks were redesigned with a waffle-like design to be injection-molded out of colored plastics. This eliminated the need to paint and provides a more durable end product.

Circuit Board Room. APH has a goal of doing as much work as possible in-house as this provides greater control over its production schedule. To address this, a room was set up and equipped to enable the Division to make prototype circuit boards rather than having to send them out to vendors. All procedures were tested and proven to be effective.

Classroom Calendar Kit. Written documentation for this new product was received from Educational Research in March 1991. Subsequently, drawings were made for a new shipping carton and for dies to be used in cutting out parts. Additionally, the artwork needed for the required silk-screens was completed.

Digital Audio Project. Previously, APH developed a technique for archiving recorded masters under a contract with the National Library Services. This work was done in the Technical Research Division. This year the Division responded to a request from the Library to archive 49 tracks. Subsequently, a request was received requesting the archiving of 30 APH titles (183 tracks) and 6 Denver titles (48 tracks). In order to meet the required completion date, the digital equipment was moved to APH's mastering area and Division staff taught mastering employees how to use the equipment to archive the recorded material.

Echo Commander. This product, which was an adaptation of a commercial product, was discontinued when the product upon which it was based was discontinued. The Division assembled a final production run of the product to fill back orders. Subsequently, notices were sent notifying customers the Echo Commander was no longer available but had been replaced with other products.

Echo II. This product replaced the Echo Commander. It is packaged with TEXTALKER or Textalker--gs. The Division provided for 500 units of the new product; 250 of each type. The repair manual for the new product was completed and turned over to APH's Electronic Repair Department.

Expanded Dolch Word Cards. A problem was discovered with this product's storage box. The box, which was not assembled was packed flat in an envelope with the word cards. During shipment, the box was found to break apart. Working with Ken Flaherty, of Stone Containers, changes were made in the design of the box which corrected the problem.

Flicker Light. In the past, this product has required three labels. One was used if the light was sold as a separate unit, another if it was sold as a component of the Bright Sights Kit, and a third caution label used in either case. The caution label is necessary to warn users of the possibility the flickering light could cause seizures in seizure-prone persons. One label was designed incorporating all necessary information. It will replace the three labels previously used.

On the Way to Literacy: Early Experiences for Young Visually Impaired Children. This product includes 10 tactile/visual storybooks. Considerable time has been spent determining the materials to be used in the production of these books. At the same time, the most efficient production processes for the manufacturing of these books have been determined as procedures quite different from the normal are required. These have been documented in an extensive production manual for this product.

Portable Sound Source II. The Division facilitated a change in the process by which this product is manufactured. A new circuit board vendor was identified who will attach the related wiring and the parts attached to the wires, providing for easier assembly at APH.

Revised Parts Lists. The Division has been responsible for revising existing parts lists for APH's educational aids. One of the changes made is the listing of parts numbers with those individual items in kits that can be purchased separately. This will eliminate the problem customers have being able to correctly identify replacement items or additional parts needed. Approximately 40 parts lists were revised and approved during the year.

Sensory Pad. The sensory pad is a new product which can be used to stimulate movement. Work on it was initiated some years ago but was tabled due to failure to find a cost-effective way to manufacture the product. Advances in technology have given promise of overcoming this problem. A prototype circuit board has been designed that incorporates the functions envisioned for this product.

Silk-Screening. Silk-screening is a process used in the manufacture of many of APH's products. Traditionally, some of the work has been done in-house and some has been jobbed out. The Division was given the opportunity of evaluating APH's silk-screening capability, again with a goal of determining how it might be enhanced to enable more



work to be done in-house for greater control over production schedules: Progress has been made in that ventilation problems have been addressed and adjustments made to everyone's satisfaction regarding worker safety, and over 100 new screens have been made for use with the automatic silk-screen press. Three employees who volunteered to work in the area were trained and screening was completed for production runs of Light Box Materials: Levels I, II, and III; Clock Face with Raised Print and Braille Numbers; over 2,000 software binders; Seated Parquetry, Fine Motor Development Materials: Twist, Turn, and Learn; and the Bright Sights Kit. Time required to silk-screen products has been greatly reduced and the rejection rate reduced to less than 1%.

Speaqualizer. The repair manual for this product was completed and turned over to the Electronic Repair Department enabling it to repair products returned for servicing.

Variable Intensity Study Lamp. Division personnel worked with Tom Poppe to redesign the base of the lamp for the dual purposes of eliminating the need to modify the dimmer switch and to enhance the appearance of the product.

Work Planned for FY 1992. In addition to continuing to work on the development of new products, implementing first production runs of new educational aids and tools, and finding solutions for other departments when problems arise, definite plans are in place for the following:

Hands On: Functional Activities for Visually Impaired  
Children--implement first production run

On the Way to Literacy: Early Experiences for Visually Impaired  
Children--implement first production run

APH Multiple Headset Adaptor--further redesign to facilitate use

APH PocketBraille--complete development of repair manual

APH Portable Plus--complete development of repair manual

Parts list--continue revising as products for which new parts lists have not been made are scheduled for production

Agencies Participating in Research

In addition to the agencies named here, appreciation is also extended to the many other agencies which cooperated with APH's research efforts by permitting members of their staffs to serve as consultants or respondents to requests for information.

Alabama School for the Blind; Talladega, Alabama  
Alliance for Technology Access; Albany, California (formerly National Special Education Alliance; Cupertino, California)  
American Council of the Blind; Washington, DC  
American Foundation for the Blind, National Technology Center; New York, New York  
Anchor Center for Blind Children; Denver, Colorado  
Apple Computer, Inc.; Cupertino, California  
BEGIN (Babies Early Growth Intervention Network); Center for the Visually Impaired, Atlanta, Georgia  
Broderbund Software; San Rafael, California  
Bucks County Intermediate Unit; Doylestown, Pennsylvania  
California School for the Blind; Fremont, California  
Capitol Area Intermediate Unit; Camp Hill, Pennsylvania  
Carr School; Lincoln Park, Michigan  
Claris Corporation; Mountain View, California  
Colorado School for the Deaf and the Blind; Colorado Springs, Colorado  
Coyle Avenue School; Carmichael, California  
Dallas Services for Visually Impaired Children; Dallas, Texas  
DeKalb County Schools; DeKalb, Georgia  
Disabled Citizens Computer Center; Louisville, Kentucky  
FOCUS Media Software, Inc.; Garden City, New York  
Foundation for Blind Children; Scottsdale, Arizona  
The Governor Morehead Preschool Program; Greensboro, North Carolina  
The Governor Morehead Preschool Program; Raleigh, North Carolina  
Indiana Department of Human Services; Indianapolis, Indiana  
Indiana School for the Blind; Indianapolis, Indiana  
International Business Machines Corporation; Louisville, Kentucky  
International Business Machines National Support Center for Persons with Disabilities; Atlanta, Georgia  
Jefferson County Public Schools; Louisville, Kentucky  
Kentucky Department for the Blind; Frankfort, Kentucky  
Kentucky School for the Blind; Louisville, Kentucky  
Kenwood Montessori School; Louisville, Kentucky  
Maryland School for the Blind; Baltimore, Maryland  
Mid-State Instructional Support Center; Harrisburg, Pennsylvania  
Mindplay Software; Tucson, Arizona  
Minnesota Educational Computing Corporation (MECC); St. Paul, Minnesota  
National Federation of the Blind; Baltimore, Maryland  
National Federation of the Blind, Research and Development; Frankfort, Kentucky  
New Mexico Commission for the Blind; Santa Fe, New Mexico  
New Mexico Preschool Program; Albuquerque, New Mexico

New Mexico School for the Visually Handicapped; Alamogordo, New Mexico  
New York Association for the Blind (The Lighthouse); New York, New York  
North Carolina Division Services for the Blind; Raleigh, North Carolina  
Ohio State University; Columbus, Ohio  
Overbrook Educational Center; Philadelphia, Pennsylvania  
Overbrook School for the Blind; Philadelphia, Pennsylvania  
Perkins School for the Blind; Watertown, Massachusetts  
Pinellas County Schools; St. Petersburg, Florida  
Price Elementary School; Louisville, Kentucky  
RC Systems; Bothell, Washington  
St. Lucy's Day School; Philadelphia, Pennsylvania  
San Francisco State University; San Francisco, California  
Sensible Software; Troy, Michigan  
Sliwa Enterprises, Incorporated; Woodland, California  
Street Electronics Corporation; Santa Barbara, California  
Teacher's College, Columbia University; New York, New York  
Tennessee School for the Blind; Nashville, Tennessee  
Texas School for the Blind and Visually Impaired; Austin, Texas  
University of Louisville, Perceptual Alternatives Lab; Louisville, Kentucky  
Utah School for the Blind; Ogden, Utah  
Valle Verde Elementary School; Walnut Creek, California  
Vision Software; Lexington, Kentucky  
Visually Impaired Preschool Services; Louisville, Kentucky

### Consultants

In addition to the consultants formally acknowledged in this section, appreciation is extended to the many individuals who have willingly given of their time and expertise in cooperating with the various research and development projects underway by responding to questionnaires, by answering less formal queries for information, and by working with research staff in countless ways such as: (a) identifying particularly talented teachers and other professionals to serve on committees and/or as expert reviewers; (b) recommending programs, teachers, and students appropriate for field evaluation sites; and (c) facilitating field evaluation efforts. Only through the splendid and continuing support of professionals working in the field and the people they serve is APH able to maintain its highly effective research and development program.

### Assessment of Braille Skills

Dr. Sharon Bradley-Johnson, Professor of School Psychology, Central Michigan University, Mt. Pleasant, Michigan

Dr. Patricia Bussen, Associate Professor, Department of Rehabilitation, University of Arkansas, Little Rock, Arkansas

Ms. Shirley Harris, Psychologist, Michigan School for the Blind, Lansing, Michigan

Mrs. Sue Kupchunas, Teacher, Florida School for the Blind, St. Augustine, Florida

Dr. Roseann Reid, retired former Chairman Education Department, The Greater Pittsburgh Guild for the Blind, Presto, Pennsylvania

### Braille Language Program

#### Teacher Evaluators

Mr. Mickey Abercrombie, Functional Reading Teacher, Colorado School for the Deaf and Blind, Colorado Springs, Colorado

Ms. Bridget Bassett, Primary Teacher of the Visually Impaired, Overbrook Educational Center, Philadelphia, Pennsylvania

Sister M. Margaret Fleming, Teacher of the Visually Impaired, St. Lucy's Day School, Philadelphia, Pennsylvania

Mr. Ted Lennox, Teacher of the Visually Impaired, Carr School, Lincoln Park, Michigan

Ms. Susan Mangis, Teacher of the Visually Impaired, Coyle Avenue School, Carmichael, California



Ms. Deborah Mason, Primary Teacher of the Visually Impaired, Overbrook Educational Center, Philadelphia, Pennsylvania

Ms. Carla McMillin, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Ms. Joan Mehlman, Teacher, Tennessee School for the Blind, Nashville, Tennessee

Ms. Marion Morrison, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Ms. Collett Perry, Teacher of the Visually Impaired, Valle Verde Elementary School, Walnut Creek, California

Ms. Karen Wood, Functional Reading Teacher, Colorado School for the Deaf and the Blind, Colorado Springs, Colorado

#### Braille Needs Meeting

Mr. Charles B. Boyer, Superintendent, California School for the Blind, Fremont, California

Ms. Lenore Dillon, Director of Itinerant Rehabilitation Teaching Program, Indiana Department of Human Services, Indianapolis, Indiana

Sr. M. Margaret Fleming, Teacher of the Visually Impaired, St. Lucy's Day School, Philadelphia, Pennsylvania

Ms. Angela Pratt, Executive Director, The Wichita Council for the Preschool Blind, Wichita, Kansas

Mr. Fred Schroeder, Director, New Mexico Commission for the Blind, Santa Fe, New Mexico

Ms. Anna M. Swenson, Teacher of the Visually Impaired, Fairfax County Public Schools, Falls Church, Virginia

Dr. Marjorie E. Ward, Professor, Department of Educational Services and Research, Ohio State University, Columbus, Ohio

#### Classroom Calendar Project

Ms. Patty Dilg, Teacher, Kentucky School for the Blind, Louisville, Kentucky

Development of Guidelines for Literacy: Selecting Appropriate Media

Mr. Norman Anderson, Teacher, Maryland School for the Blind, Baltimore,  
Maryland

Dr. Natalie Barraga, Professor Emeritus, University of Texas, Austin, Texas

Mr. Charles B. Boyer, Superintendent, California School for the Blind,  
Fremont, California

Mr. John di Francesco, President, Braille Revival League, American Council of  
the Blind, Oakland, California

Sr. M. Margaret Fleming, Teacher of the Visually Impaired, St. Lucy's Day  
School, Philadelphia, Pennsylvania

Dr. Randall Jose, Optometrist, Tulsa, Oklahoma

Dr. Sally S. Mangold, Professor, San Francisco State University, San  
Francisco, California

Mrs. Suzi McDonald Newbold, Preschool Teacher, Arizona School for the Deaf and  
Blind and the Foundation for Blind Children, Scottsdale, Arizona

Dr. Evelyn Rex, Professor, Illinois State University, Normal, Illinois

Mr. Fred Schroeder, Director, New Mexico Commission for the Blind, Santa Fe,  
New Mexico

Dr. Susan Spungin, Associate Executive Director, American Foundation for the  
Blind, New York, New York

Early Childhood Microcomputer Applications

Mr. Jim Allen, Computer Specialist, Texas School for the Blind, Austin, Texas

Mrs. Linda Clarke, Mentor Teacher, Los Angeles Unified Schools, Los Angeles,  
California

Sr. M. Margaret Fleming, Teacher of the Visually Impaired, St. Lucy's Day  
School, Philadelphia, Pennsylvania

Educational Research and Development Committee

Dr. Michael J. Bina, Superintendent, Indiana School for the Blind,  
Indianapolis, Indiana

Mrs. Barbara N. Bowman, Director, Instructional Materials Resource Center,  
Richmond, Virginia

Mr. Charles B. Boyer, Superintendent, California School for the Blind,  
Fremont, California

Ms. Suzanne G. Swaffield, Consultant, Visually Handicapped, South Carolina  
Department of Education, Columbia, South Carolina

Mr. John D. Watson, Director, Special Education Materials Clearinghouse and  
Depository, Tacoma, Washington

Dr. Richard L. Welsh, Executive Director, The Greater Pittsburgh Guild for the  
Blind, Bridgeville, Pennsylvania

Dr. Robert J. Winn, President, The Hadley School for the Blind, Winnetka,  
Illinois

#### Infant Skills Project

##### Teacher Evaluators

Mrs. Melinda Adkins, Teacher, Visually Impaired Preschool Services,  
Louisville, Kentucky

Ms. Debbie Alvarado, Teacher, Dallas Services for Visually Impaired Children,  
Dallas, Texas

Mrs. Sharon Bensinger, Director, Visually Impaired Preschool Services,  
Louisville, Kentucky

Mrs. Phyllis Cole, Supervisor, DeKalb County Schools, DeKalb, Georgia

Ms. Carol Danielson, Supervisor, Dallas Services for Visually Impaired  
Children, Dallas, Texas

Ms. Anne McComiskey, Director, BEGIN Program Center for the Visually Impaired,  
Atlanta, Georgia

Ms. Tammy Shirley, Occupational Therapist, Dallas Services for Visually  
Impaired Children, Dallas, Texas

Mrs. Charlie Sirman, Teacher, Visually Impaired Orthopedically Handicapped  
Classes, DeKalb County Schools, DeKalb, Georgia

Ms. Suze Stagus, Teacher, Visually Impaired Preschool Services, Louisville,  
Kentucky

Microcomputer Applications

- Mr. Jim Allan, Data Services Specialist, Texas School for the Blind and Visually Impaired, Austin, Texas
- Ms. Patty Barker, Technology Interface Specialist, Division of Services for the Blind, Raleigh, North Carolina
- Dr. Michael J. Bina, Supteintendent, Indiana School for the Blind, Indianapolis, Indiana
- Ms. Linda Bishop, Doctoral Student, Vanderbilt University/Peabody College, Nashville, Tennessee
- Ms. Judy Bliss, President, Mindplay Software, Tucson, Arizona
- Mr. Randy Carlstrom, President, RC Systems, Inc., Bothell, Washington
- Dr. Tim Crammer, Director, Research and Development, National Federation of the Blind, Frankfort, Kentucky
- Dr. Emerson Foulke, Director, Perceptual Alternatives Lab, University of Louisville, Louisville, Kentucky
- Ms. Carol Hamlett, Systems Programmer, Expert Systems Software, Inc., Nashville, Tennessee
- Mr. Chuck Hartley, President, Sensible Software, Troy, Michigan
- Mr. Frank Irzyk, Resource/Media Specialist, Central Pennsylvania Special Education Resource Center, Harrisburg, Pennsylvania
- Mr. Marty Larson, Research Analyst, Minnesota Educational Computing Corporation, St. Paul, Minnesota
- Mr. Dave Lyons, Programmer, Apple Computer, Inc. and DAL Systems, Cupertino, California
- Ms. Harleen Powers, Computer Teacher, Florida School for the Deaf and the Blind, St. Augustine, Florida
- Dr. Sandy Ruconich, Computer Specialist, Kentucky School for the Blind, Louisville, Kentucky
- Dr. Steve Sliwa, President, Sliwa Enterprises, Inc., Woodland, California
- Dr. Milo Street, President, Street Electronics Corporation, Carpinteria, California



Dr. Steve Sliwa, President, Sliwa Enterprises, Inc., Woodland, California

Dr. Milo Street, President, Street Electronics Corporation, Carpinteria, California

Mr. Wayne Thompson, Engineer, Kentucky Department for the Blind, Frankfort, Kentucky

Ms. Linda Unger, Vice-President of Product Development, FOCUS Media Software, Inc., Garden City, New York

Ms. Cindy Young, Systems Engineer, International Business Machines Corporation, Louisville, Kentucky

Multihandicapped Adolescent Project

Mrs. Jackie Brennen, Supervisor of Life Skills Program, Overbrook School for the Blind, Philadelphia, Pennsylvania

Ms. Mary Jane Brown, Program Administrator, Multihandicapped Program, New York Institute for Special Education, New York, New York

Mrs. Diane Haynes, Early Childhood Teacher, Deaf-Blind Intervention Project, Lexington, Kentucky

Dr. Bernadette Kappen, Associate Director, Overbrook School for the Blind, Philadelphia, Pennsylvania

Ms. Donna Karlson, Vocational Teacher, New York Institute for Special Education, New York, New York

Ms. Martha Majors, Assistant Supervisor, Deaf-Blind Program, Perkins School for the Blind, Watertown, Massachusetts

Ms. Betsy McGinnity, Coordinator of Vocational and Transitional Services, Perkins School for the Blind, Watertown, Massachusetts

Mrs. Marie Ruf, Transition Teacher, Deaf-Blind Intervention Project, Lexington, Kentucky

Mrs. Mary Zatta, Teacher, Deaf-Blind Program, Perkins School for the Blind, Watertown, Massachusetts

New Educational Measures Identification

Dr. Sharon Bradley-Johnson, Professor of School Psychology, Central Michigan University, Mt. Pleasant, Michigan

Dr. Joan B. Chase, Associate Professor, UMDNJ--Robert Wood Johnson Medical School, Piscataway, New Jersey

Ms. Shirley Harris, Psychologist, Michigan School for the Blind, Lansing,  
Michigan

Ms. Suzanne G. Swaffield, Consultant, Visually Handicapped, South Carolina  
Department of Education, Columbia, South Carolina

#### Parent Early Childhood Education Series

Dr. Natalie Barraga, Professor (Emeritus), University of Texas, Austin, Texas

Dr. Vivian Correa, Professor, University of Florida, Gainesville, Florida

Dr. Verna Hart, Professor, University of Pittsburgh, Pittsburgh, Pennsylvania

Dr. Bernadette Kappen, Associate Director, Overbrook School for the Blind,  
Philadelphia, Pennsylvania

#### Parents and Visually Impaired Infants (PAVII)

Ms. Gail Cavello, Home Counselor, Blind Babies Foundation, San Francisco,  
California

Dr. Deborah Chen, Director of Special Education, Foundation for the Junior  
Blind, Los Angeles, California

Mrs. Amy Hosa, Parent, San Francisco, California

Dr. Claire Taylor Friedman, Infant Specialist, Contra Costa County, San  
Francisco, California

#### Preschool Learning Activities

Mrs. Jenny Guilda, Director, Kenwood Montessori School, Louisville, Kentucky

Mrs. Katherine Robinson, Teacher/Director, Montessori Program,  
Coleridge-Taylor Elementary School, Jefferson County Public Schools,  
Louisville, Kentucky

#### Teacher Evaluators

Ms. Melinda Atkins, Teacher, Visually Impaired Preschool Services, Louisville,  
Kentucky

Ms. Debbie Alvarado, Teacher, Dallas Service for Visually Impaired Children,  
Dallas, Texas

Ms. Sandy Bryant, Teacher, Preschool Service for the Visually Impaired, North  
Carolina Division Services for the Blind, Raleigh, North Carolina

- Ms. Martha Chambers, Teacher, New Mexico School for the Visually Handicapped  
Preschool, Albuquerque, New Mexico
- Mrs. Phyllis Cole, Vision Supervisor, DeKalb County Schools, Atlanta, Georgia
- Ms. Patti Dilg, Teacher, Kentucky School for the Blind, Louisville, Kentucky
- Mrs. Lenore Donelson, Supervisor, Dallas Services for Visually Impaired  
Children, Dallas, Texas
- Dr. Sally Dietz, Supervisor, Lighthouse for the Blind, New York, New York
- Mrs. Betty Dominguez, Supervisor/Director, New Mexico Preschool Program for  
Blind Children, Albuquerque, New Mexico
- Mrs. Pauletta Feldman, Parent, Louisville, Kentucky
- Ms. Julie Founder, Teacher, Alabama School for the Blind, Talladega, Alabama
- Ms. J. Greeley, Teacher, Anchor Center for Blind Children, Denver, Colorado
- Ms. Sandra Handy, Teacher, Utah School for the Blind, Ogden, Utah
- Ms. Barbara Hatfield, Teacher, Utah School for the Blind, Ogden, Utah
- Mrs. Debbie Hatton, Director, Preschool Services for the Visually Impaired,  
Raleigh, North Carolina
- Ms. Judy Hayes, Teacher, Alabama School for the Blind, Talladega, Alabama
- Mrs. Diane Haynes, Teacher, Deaf Blind Intervention Program, Lexington,  
Kentucky
- Ms. Jeanette Jacobs, Teacher, Jefferson County Public Schools, Louisville,  
Kentucky
- Ms. Betty Knight, Teacher, Alabama School for the Blind, Talladega, Alabama
- Mrs. Camille Lancaster, Teacher, Preschool Service for the Visually Impaired,  
North Carolina Division Services for the Blind, Raleigh, North Carolina
- Ms. Eileen Mauerman, Teacher, Utah School for the Blind, Ogden, Utah
- Ms. Susie Moushegian, Teacher, Teacher, Dallas Service for Visually Impaired  
Children, Dallas, Texas
- Ms. Mary Ann O'Connor, Teacher, St. Lucy's School, Philadelphia, Pennsylvania
- Ms. Kathy Peterson, Teacher, New Mexico School for the Visually Handicapped  
Preschool, Albuquerque, New Mexico

Mrs. Debbie Ramsey, Teacher, Jefferson County Public Schools, Louisville, Kentucky

Ms. Maureen Ryder, Teacher, New York Association for the Blind (The Lighthouse); New York, New York

Mrs. Kathy Scott, Vision Supervisor, Capital Area Intermediate Unit, Harrisburg, Pennsylvania

Mrs. Charlie Sirman, Teacher, Visually Impaired Orthopedically Handicapped Classes, DeKalb County School System, Atlanta, Georgia

Ms. Rose Anna Stillwagon, Evaluator, Capital Area Intermediate Unit, Camp Hill, Pennsylvania

Ms. Ann Timfhenka, Teacher, Capital Area Intermediate Unit, Camp Hill, Pennsylvania

Mrs. Martha Waites, Teacher, Alabama School for the Blind, Talladega, Alabama

#### Summer Seminars

##### Early Childhood Education of the Visually Handicapped: Basic

Kay Alicyn Ferrell, Associate Professor, Teacher's College, Columbia University, New York, New York

##### Early Childhood Education of the Visually Handicapped: Advanced

Kay Alicyn Ferrell, Associate Professor, Teacher's College, Columbia University, New York, New York





Department of Educational and Technical Research Personnel

June Morris, MA, Executive Vice-President

Educational Research

|                         |                              |
|-------------------------|------------------------------|
| Bolin, Gene             | Administrative Assistant     |
| Burton, Tobey, BA, OTR  | Research Assistant           |
| Caton, Hilda, EdD       | Research Scientist           |
| Duckworth, Bill, MS     | Librarian/Research Scientist |
| Elder, Venus, MA        | Research Assistant           |
| Meredith, Rob           | Programmer                   |
| Moore, Sheri, EdD       | Research Scientist           |
| Otto, Fred, BA          | Research Assistant           |
| Pester, Eleanor, MS     | Research Associate           |
| Poppe, Karen Peters, BA | Research Assistant           |
| Poppe, Tom              | Model and Pattern Maker      |
| Skutchan, Larry, BA     | Systems Programmer           |
| Willis, Deborah, MA     | Research Scientist           |
| Wright, Suzette, BA     | Research Associate           |

Technical Research Division

|                  |                              |
|------------------|------------------------------|
| Donhoff, Darlene | Technical/Clerical Assistant |
| Hayden, Frank    | Manufacturing Specialist     |
| Phelps, Bob      | Manager                      |
| Robinson, Jim    | Manufacturing Specialist     |

Contracted Personnel

Bradley, Eddy Jo, MA  
Hamp, Eric, PhD  
Langley, M. Beth, MS  
Petrosko, Joseph M., PhD  
Stone, Gretchen, MEd  
Stratton, Josephine, MS  
Wheatley, Jeff



Publications

- Elder, V. W., & Otto, F. L. (Eds.). (1991, Spring). Micro Materials Update.
- Moore, S. B. (1990). References and resources on young blind and visually impaired children. AER Division 8 Newsletter.
- Moore, S. B., & Chen, D. (1990). The parents and visually impaired infants project. The California Transcriber. 34(1), 16-18.
- Otto, F. L. (Ed.). (1990, Fall). Micro Materials Update.
- Skutchan, L. (1991, Spring). Telecommunications: Getting on line, File Transfers. Micro Materials Update, p. 3.
- Skutchan, L. (1991, Fall). Telecommunications: Getting on line, Part II. Micro Materials Update, p. 7.
- Skutchan, L. (1991, Fall). Telecommunications: Getting on line with MS-DOS. BAUD. 9(1), 1.
- Wright, S. J., & Stratton, J. M. (1991). On the way to literacy: Early experiences for young visually impaired children. Re:view, 23, 55-63.

PROGRAM MATERIALS

- Caton, H., Pester, E., & Bradley, E. J. (1990). Read again: A braille program for adventitiously blinded print readers--braille teacher's edition. Louisville, KY: American Printing House for the Blind.
- Caton, H., Pester, E., & Bradley, E. J. (1990). Read again: A braille program for adventitiously blinded print readers--levels A-I. Louisville, KY: American Printing House for the Blind.
- Caton, H., Pester, E., & Bradley, E. J. (1990). Read again: A braille program for adventitiously blinded print readers--print teacher's edition. Louisville, KY: American Printing House for the Blind.
- Hamlett, C., Willis, D., Meredith, R., & Otto, F. (1990). Talking Typer Teacher's Manual. Louisville, KY: American Printing House for the Blind.





Presentations and Workshops

- Caton, H. R., & Pester, E. J. (1990, July). Transition from lost vision to braille reading. Association for Education and Rehabilitation of the Blind and Visually Impaired International Conference, Washington, DC.
- Meredith, R., & Otto, F. (1989, August). APH talking software. Inservice for Jefferson County Itinerant Teachers, Louisville, KY.
- Moore, S. B. (1990, July). Choosing materials for very young visually impaired learners. Columbia University, New York, NY.
- Moore, S. B. (1991, April). Educational materials for young and multihandicapped visually impaired children. Early Childhood Statewide Conference, Columbus, OH.  
Tuscaloosa, AL.
- Moore, S. B. (1991, April). Techniques and materials for parents and teachers of young blind and multihandicapped visually handicapped children. Ohio Resource Center for Low Incidence, Columbus, OH.
- Moore, S. B., & Caton, H. (1991, June). Workshop on materials for the young and multihandicapped visually impaired student. Review Statewide Training, Bowling Green, KY.  
Schools, San Diego, CA.
- Moore, S. B., & Poppe, K. J. (1990, July). PAVII (Parents and visually impaired infants) materials. AER International Conference, Washington, DC.
- Pester, E. J. (1990, September). Meet APH, new braille reading materials, and games for visually impaired. National Federation of the Blind Heartland Chapter, Kankakee, IL.
- Pester, E. J. (1990, August). Research and braille instruction for adults. Mid-America Conference of Rehabilitation Teachers, Chicago, IL.
- Pester, E., & Gissoni, F. (1991, March). Dating for young and old: Calendars for the visually handicapped. Kentucky CEC Conference, Ft. Mitchell, KY.
- Pester, E. (1991, July). What's new in braille at APH? American Council of the Blind Convention, Braille Revival League Meeting, Tampa, FL.
- Pester, E., & Gissoni, F. (1991, June). Dating for young and old: Calendars for the visually handicapped. North Central Regional AER Conference, Minneapolis, MN.
- Skutchan, L. (1991, June). Tools and techniques for effective note-taking. Kentucky School for the Blind, Louisville, KY.

- Skutchan, L., & Meredith, R. (1991, March). Introduction to micorcomputers. Kentucky School for the Blind, Louisville, KY.
- Willis, D. H. (1991, March). Improving typing skills of blind students using a computer with speech output. KY-CEC, Ft Mitchell, KY.
- Willis, D. H., & Mudd, G. (1990, July). Computer materials for totally blind students. AER International Conference, Washington, DC.
- Willis, D. H., Ruconich, S., Skutchan, L., Meredith, R., & Robinson, J. (1991, March). Computer products that enhance the lives of blind people. Special presentation for advanced program students from Price Elementary School, American Printing House for the Blind, Louisville, KY.
- Willis, D. H., & Skutchan, L. (1990, October). Computer products and programs. Annual Meeting, American Printing House for the Blind, Louisville, KY.
- Willis, D., Skutchan, L., & Gissoni, R. (1991, April). Talking computer products for blind students. Special presentation for computer club from St. Albert the Great School, American Printing House for the Blind, Louisville, KY.
- Wright, S. J., & Stratton, J. M. (1990, July). On the way to literacy: Early experiences for young visually impaired children. AER International Conference, Washington, DC.

New Products

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